

ST. PETER AQUIFER REMEDIAL INVESTIGATION PLAN FOR THE REILLY TAR & CHEMICAL CORPORATION N.P.L. SITE, ST. LOUIS PARK, MINNESOTA



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Amended October 8, 1987

Prepared for:

The City of St. Louis Park St. Louis Park, Minnesota 55416

ERT - A RESOURCE ENGINEERING COMPANY 5871 Cedar Lake Road, St. Louis Park, Minnesota 55416

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Section A - Site Management Plan

Section B - Quality Assurance Project Plan

Section C - Health & Safety Plan

Section D - Community Relations Plan

SECTION A SITE MANAGEMENT PLAN

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PURPOSE AND SCOPE

The purpose of this Remedial Investigation is to determine the nature and extent of ground-water contamination in the St. Peter Aquifer in the vicinity of the former Reilly Tar & Chemical Corporation site in St. Louis Park, MN, and to gather pertinent data necessary for the completion of a Feasibility Study. The issue of ground-water contamination in the St. Peter Aquifer has long been debated. During the course of settlement negotiations in United States of America, et al. v. Reilly Tar & Chemical Corporation et al., an evaluation of existing data led to the agreement embodied in the Consent Decree and Remedial Action Plan (RAP). It was agreed that the final Remedial Action(s) for the St. Peter Aquifer could not be precisely defined without further limited investigations. This Remedial Investigation does not take on the broad scope of many other Superfund Remedial Investigations, because the Consent Decree specifies a scope of work limited to the installation of five new monitoring wells, and three rounds of ground-water monitoring. Also, the results of a significant effort to evaluate alternative remedial actions have been embodied in the Consent Decree. If this investigation identifies a spread of water that exceeds the drinking water criteria, as defined in Section 2.2 of the RAP, a Feasibility Study may be required. The Feasibility Study would identify and evaluate remedial action alternatives for limiting the further spread of contamination. The preferred Remedial Action that would be emphasized in the Feasibility Study is the installation and operation of a gradient control well system consisting of one or two gradient control wells.

To accomplish this Remedial Investigation, seven tasks will be addressed:

- Task 1 Description of Current Situation
- Task 2 Plans and Management
- Task 3 Site Investigation
- Task 4 Site Investigation analysis
- Task 5 Laboratory and Bench-Scale Studies
- Task 6 Reports
- Task 7 Community Relations Support

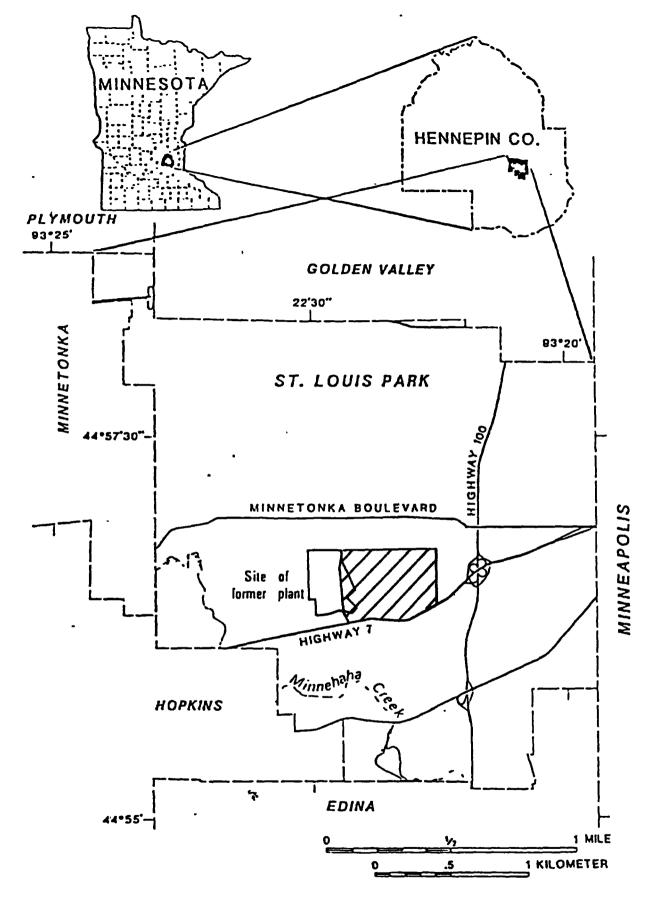
This investigation will follow U.S. EPA "Guidance on Remedial Investigation Under CERCLA" (dated June 1985) in order to meet the requirements of the CD-RAP. However, in following said guidance, the City of St. Louis Park relinquishes no rights granted it under the applicable Parts of the Consent Decree.

TASK 1 DESCRIPTION OF CURRENT SITUATION

Background and Nature and Extent of Problem

The former Reilly site occupies 80 acres in St. Louis Park (Figure 1). A coal tar refinery and wood preserving plant was operated at the site from 1917 to 1972. In 1972 the site was sold and converted

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(From USGS Water Supply Paper 2211)

FIGURE 1 LOCATION MAP

to residential and recreational uses. Also, a divided four lane avenue (Louisiana Avenue) and storm sewer improvements were constructed on the site. Soil and surficial ground-water contamination by a variety of coal-tar-related chemicals have been observed in the immediate vicinity of the former plant site. In addition, polynuclear aromatic hydrocarbons (PAH), which are constituents of creosote and coal tar, have been measured in some of the bedrock aquifers in the St. Louis Park area.

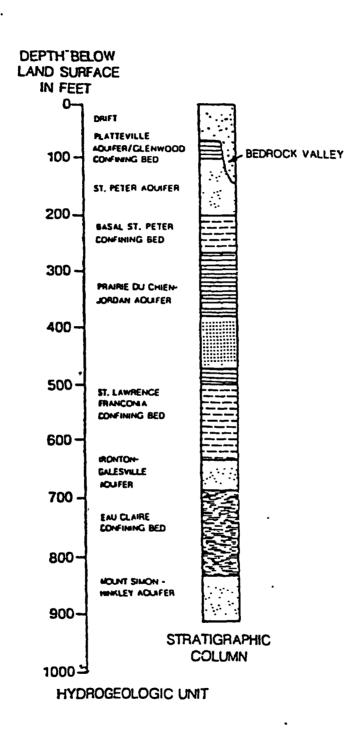
The relationship between the St. Peter Aquifer and other bedrock units and glacial deposits is shown in Figures 2 and 3. At the former Reilly plant site, approximately 65 feet of Drift and 30 feet of Platteville Limestone and Glenwood Shale overlie the St. Peter Aquifer. In the vicinity of the former Reilly site, within the City of St. Louis Park, the Platteville and Glenwood bedrock units have been removed by erosion, and the drift directly overlies the St. Peter Aquifer (Figure 4). Wells that have been completed in the St. Peter Aquifer are shown in Figure 5. Table 1 includes the available well logs for St. Peter Aquifer monitoring wells. Table 2 presents the available PAH data for the St. Peter Aquifer. Figure 6 shows the regional ground-water flow pattern in the St. Peter. Figure 7 shows water level contours based on more recent data provided by The Minnesota Pollution Control Agency (MPCA). Table 3 presents MPCA's water level data in tabular form.

Bedrock Valleys

The distribution of "buried bedrock valleys" is important because they may provide a preferential pathway for contaminants to migrate from contaminated areas of the Drift-Platteville Aquifer (Figures 8 through 14 and Tables 4 and 5) into the St. Peter Aquifer. This has been suggested by the USGS in their 1981 report "Preliminary Evaluation of Ground-Water Contamination by Coal-Tar Derivatives, St. Louis Park, Minnesota". Insufficient field data exist with which to determine the role of bedrock valleys in contaminant migration, however, water level data and the presence of low permeability glacial till indicate that this particular pathway may not be a major pathway for the migration of contaminants into the St. Peter Aquifer. The role of bedrock valleys in contaminant migration will be evaluated in this Remedial Investigation.

The RAP addresses the possibility of contaminant migration via bedrock valleys in Sections 9.1. and 9.2. These sections require source and gradient control wells for containing contaminant migration in the Drift-Platteville Aquifer (Figure 15). These wells will help to prevent contamination from reaching the bedrock valleys and entering the St. Peter Aquifer.

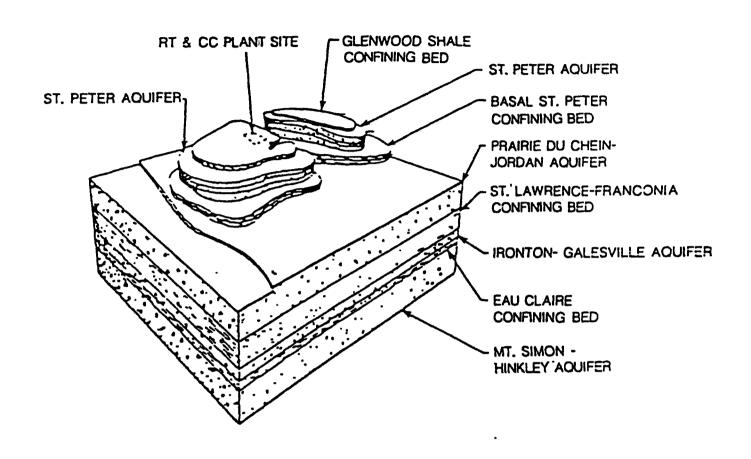
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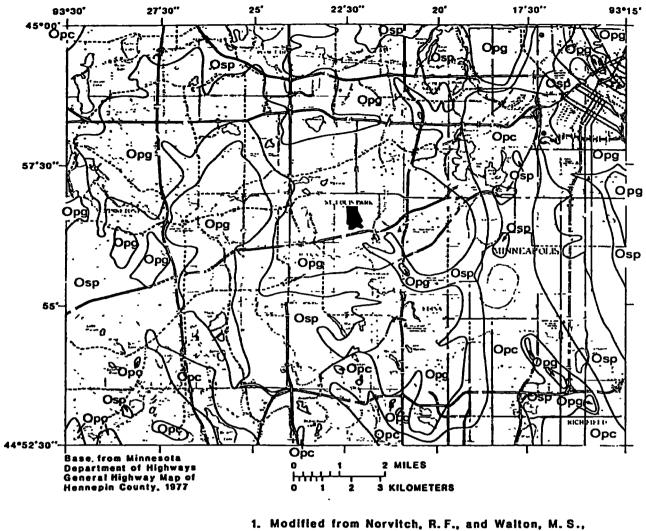
(Illustration Modified From Record of Decision, May 25, 1984.)

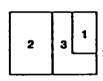
FIGURE 2 STRATIGRAPHIC PROFILE

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(Illustration From Record of Decision, May 25, 1984.)





- Modified from Norvitch, R.F., and Walton, M.S., 1979, U.S. Geological Survey Miscellaneous Investigations Map 1-1157
- 2. Modified from Minnesota Geological Survey, Unpublished Map
- 3. This study

INDEX TO GEOLOGIC MAPPING

EXPLANATION

CORRELATION OF MAP UNITS

Opp Platteville and Glenwood Formations, undivided

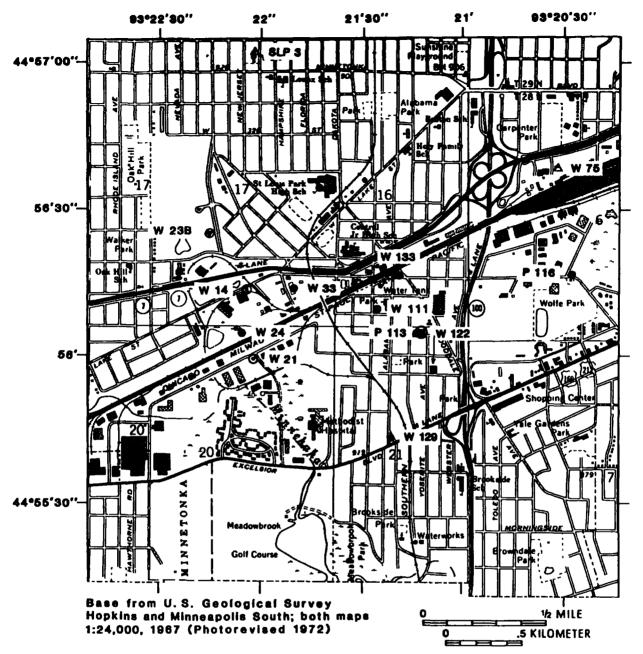
Osp St. Peter Sandstone

Opc Prairie du Chien Group

Approximate geologic contact

Site of former plant

Figure 4. Preliminary Bedrock Geology (WSP 2211)



EXPLANATION

- w 33 Location and project well number
 - Observation well completed in St. Peter aquifer
 - Observation well completed in basal St. Peter confining bed
 - ▼ Multiaquifer well fitted with temporary packer
 - △ Platteville—St. Peter multiaquifer well in which water levels are periodically measured
- ⊙ W 14 Circle denotes well in which water levels were monitored with a digital recorder during part of 1978–81

Figure 5 Location of wells completed in the St. Peter aquifer or basal St. Peter confining bed

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			4

Table 1. Data on selected wells in the St. Louis Park area, Minnesota

Township and range: First three (or two) digits indicate township north of the baseline; next two digits indicate range north of the principal meridian; last digit(s) indicate(s) section in which well is located. Letters indicate well location in section; first letter denotes the 160-acre tract; second letter denotes the 40-acre tract; third letter denotes the 10-acre tract. Letters are assigned counterclockwise beginning with the northeast quarter. Consecutive numbers beginning with 1 are added as suffixes to distinguish wells within a given 10-acre tract.

Site identification (lat and long): First six digits are latitude of well location in degrees, minutes, and seconds; next seven digits are longitude in degrees, minutes, and seconds; last two digits are arbitrarily assigned to distinguish wells within a given 1-second by 1-second area.

Reported log: Qd, dnft, undifferentiated; Opl, Platteville Limestone; Ogl, Glenwood Shale; Osp, St.

Peter Sandstone, undifferentiated: Ospl. St. Peter Sandstone, lower siltstone beds: Opc. Praine du Chien Group; CJ, Jordan Sandstone; Csl, St. Lawrence Formation; Cf, Franconia Sandstone; Cig, Ironton and Galesville Sandstones; Ce, Eau Claire Sandstone; Cm, Mount Simon Sandstone; p€h, Hinckley Sandstone.

Altitude: When MP is given, altitude is for measuring point, not land surface.

Field measurement status: A, well field located and permanently sealed or reconstructed; AH, well field located and permanently sealed by MDH; AR, well reported permanently sealed; BR, well reported filled; D, well field located and contains debris; F, well field located; G, well field located and geophysically logged; M, mass-measurement well (measured 2 to 3 times per year); O, observation well (measured every 2 to 3 weeks); P, well field located and has pump; X, well destroyed.

Township and range	Site identification (lat and long)	Minnesota unique well number	USGS project well number	Owner name or other identifiers	Driller	Date drilled	Reported log, in feet	Land surface altitude, in feet	Reported depth of well, in feet	Diameter, in inches, and depth, in feet, of casing	Aquifer(s) open to well bore	Water level, in feet	Date measured	Field measurement status
117.21.17 AABI.	445654093215501	216030	WI	Monitoring well —— E	E. H. Renner	-03-76	0-102 Qd 102-107 Opl	922.76 MP	107	4 in. 0-102	Opl	43.67	11-28-78	0
117.21.17 BAC1.	445651093222901	216031	W2	do	do	-03-76	0-36 Qd	897.14 MP	36	4 in. 0-32	Qd	10.40	11-28-78	0
117.21.17 BDB1.	445637093222401	216032	W3	do	do	-05-76	0-52 Qd	897	52	4 in. 0-49	Qd	7	05-10-76	D,X
117.21.17 CAD2.	445622093221901	216033	W5	do	do	-02-76	0-26 Qd	891.72 MP	26	4 in. 0-21	Qd	6.59	11-28-78	0
117 21 17 CAC1.	445620093222601	216034	W6	do	do	-02-76	0-26 Qd	892.74 MP	26	4 in. 0–22	Qd	7.39	11-28-78	0
117.21.17 CBDI.	445625093223601	216035	W7	do	do	-03-76	0-71 Qd	930	71	4 in. 0–66	Qd	35	03-02-76	D,X
117.21.17 CDD1.	445607093222101	216036	ws	do	do	-02-76	0-31 Qd	892.87 MP	31	4 in.	Qd	7.96	11-28-78	0
117.21 17 DCAL	445614093220301	216037	W9	do	do	-02-76	0-25 Qd	891.21 MP	25	4 in. 0-20	Qd	7.13	11-27-78	0
117 21.20 ABDI.	445559093220201	216038	W10	do	do	02-76	0-29 Qd	891.82 MP	29	4 in. 0–25	Qd	`7.63	11-27-78	0
117 21.17 ODB2.	445614093215301	216039	WII	do	do	11-76	0-23 Qd	897 20 MP	23	4 m. 0–19	Qd	13.63	11-27-78	0
117 21.17 6 DDA1	445613093214001	216040	W12	do	do	12-76	0-47 Qd	919.26 MP	47	4 in. 0–42	Qd	37.02	11-27-78	o
117 21.17 6 DCB1	445615093220901	216041	W13	do	do	11-76	0-50 Qd	890 40 MP	50	4 in. 0-45	Qd	6 19	11-28-78	0

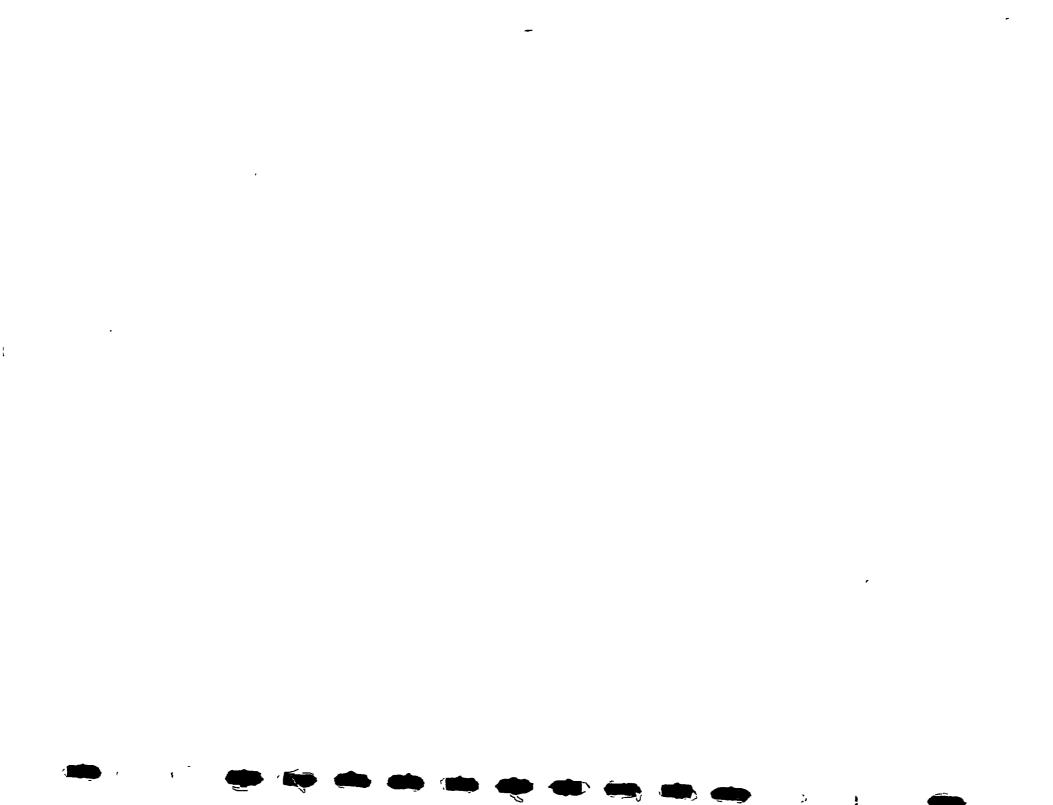


Table 1. Data on selected wells in the St. Louis Park area, Minnesota—Continued

Township and range	Site identification (lat and long)	Minnesota unique well number	USGS project well number	Owner name or other identifiers	Driller	Date drilled	Reported log. in feet	Land surface altitude, in feet	Reported depth of well, in feet	Diameter, in inches, and depth, in feet, of casing	Aquifer(s) open to well bore	Water level, in feet	Date measured	Field measurement status
117.21 16 DAA1.	445625093210301	216057	W35	Burdick Grain Co		About 1910		912		4 m.	Opl(°)~Osp(°)	51 6	10-20-78	P,M
										1	_M:	31_77_	10-25-78	F.O

Table 1. Data on selected wells in the St. Louis Park area, Minnesota—Continued

Township and range	Site identification (lat and long)	Minnesota unique well number	USGS project well number	Owner name or other identifiers	Driller	Date drilled	Reported log,	Land surface altitude, in feet	Reported depth of well, in feet	Diameter, in inches, and depth, in feet, of casing	Aquifer(s) open to well bore	Water level, in feet	Date measured	Field measurement status
117.21.17 CDC2.	445610093222602	206448	W25	Lakeland Door	do	-11-50	0-79 Qd 79-85 Opl	888.79 MP	85	3 in. 0-79	Opl	4.39	10-15-78 11-01-50	G,0
117.21.17 CDAI.	445619093221801	209344	W26	Mill City Plywood	do	-08-52	0-59 Qd 59-90 Opi	891.45 MP	90	4 in. 0-76	Opl	, 6.90 3.5	10-13-78 08-05-52	G,0
117.21.17 DBC1.	445624093220801	216052	W27	Terry Excavating	do	- 1953	0-80 Qd 80-100 Opl 100-112 Osp	905	112	4 in.	Opi-Osp	30	1953	G,0
117.21.17 CDB1.	445619093222501	216053	W28	7401 Walker St		-Before 1939		895	_	_				×
117.21.20 A BAA2.	445604093223801	206454	W29	Flame Industries 1	E. H. Renner -	-04-63	0-73 Qd 73-90 Opl	897	335	10 in. 0-77	Орс	68	04-12-63	P

Table 1. Data on selected wells in the St. Louis Park area, Minnesota—Continued

Township and range	Site identification (lat and long)	Minnesota unique well number	USGS project well number	Owner name or other Date identifiers Driller drilled	Reported log, in feet	Land surface altitude, in feet	Reported depth of well, in feet	Diameter, in inches, and depth, in feet, of casing	Aquifer(s) open to well bore	Water level, in feet	Date measured	Field measurement status
17.21.17 DCA2.	445614093220302	216042	W14	do do02-77	0-68 Qd 68-82 Opl 82-85 Ogl 85-95 Osp	891 41 MP	95	8 in. 0 -69 4 in. 0-86	Osp	23.75	11-27-78	G.O
17.21.17 (CAC2.	445621093222601	216043	WIS	do do04-77	0-76 Qd	892.47 MP	76	4 m.	Qd	8.30	11-28-78	0
17.21.20 (ABD2	445559093220202	216044	W16	do do04-77	0-73.5 Qd	892.07 MP	64	4 in. 0-61	Qd	8.56	11-27-78	o
17.21.17 d DDB3.	445614093215302	216045	W17	do do04-77	0-69 Qd	897.07 MP	69	4 in. 0-66	Qd	14.05	11-27-78	o
17.21.17 · DCA3.	445614093220303	216046	WIS	do 1978	0-68 Qd 68-78 Opi	893.23 MP	78	4 in. 0-68	Opl	9.86	11-27-78	0
17.21.17 (CDD2.	445607093222102	216047	W19	do 1978	0-72 Qd 71-81 Opl	894.43 MP	81	4 in. 0-81	Opl	11.22	11-28-78	0
17.21 20 (445605093215101	216048	W20	do 1978	0-69 Qd 69-80 Opl	895 55 MP	80	4 in. 0-70	Opi	14.01	11-27-78	0
17.21.20 (ABD3.	445559093220203	216049	W21	do1978	0-87 Qd 87-92 Osp	892.60 MP	92	4 in. 0 -9 2	Osp	24.27	11-27-78	0
17.21.17 (CAA1.	445630093222101	200993	W22	Republic Creosote do 12-47 Washroom Well.	0-65 Qd 65-91 Opl 91-91 Osp	896.16 MP	91	4 in. 0-71	Originally Opl-Osp Now Opl.	11,44	11-28-78	G,O
17.21.17 · CADI.	445625093221601	216050	W23	Republic Creosote McCarthy12-17 to Site "Hinckley" 05-18 well on site, Cooling well.		894,49 MP	909	12 in. 0-65 10 in. 0-257 7 in < 230-373	Originally Cj., Csl., Cf., Cig., Ce., Cm Now Osp., Opc., Cj., Csl., Cf.	33.15	11-28-78	G.O
17.21.20 ABB1	445604093220501	160018	W24	Monitoring well E. H. Renner -1978	0-81 Qd 81-83 Opl 83-86 Ogl 86-90 Osp	892 92 MP	90	8 in 0-81.5 4 in. 0-86 7	Osp	22.84	11-27-78	o

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Ground-Water Contamination by Coal-Tar Derivatives,

Table 1. Data on selected wells in the St. Louis Park area, Minnesota—Continued

Township and range	Site identification (lat and long)	Minnesota unique well number	USGS project well number	Owner name or other identifiets	Driller	Date drilled	Reported log, in feet	Land surface altitude, in feet	Reported depth of well, in feet	Diameter, in inches, and depth, in feet, of casing	Aquifer(s) open to well bore	Water level, in feet	Date measured	Field measurement status
117.21.17 CCA3.	445614093224001	216078	W60	3645 Rhode Island Ave.	E. H. Renner -	نقد جوجوبا		935	250	6 in.	Opl-Osp		-	AH
117.21.17 DDD3.	445607093214001	216079	W61	William V. Terry	*******			905						
117.21.8 CAA1.	445721093221801	206438	W62	McCourtney ————— Plastics.	do	·09-66	0-86 Qd 86-103 Opl 103-105 Ogl 105-274 Osp 274-394 Opc	910	394	12 in. 0-90 10 in. 0-246	Ospl-Ope	88	09-08- 69	Р
117.21.20 CBB1.	445538093224501	216080	,W63	National Foods	McCarthy	09-45		910	285	10 in. inside 12 in.	_	75	09-00-45	P
117.21 17 DDD4.	445607093214202	206451	W65	Ace Manufacturing - Strom Block.	E. H. Renner -	09-58	0-77 Qd 77-93 Opl 93-95 Ogl 95-109 Osp	904	109	4 in. 0-77	Opl-Osp	24.68	12-01-78	F
117.21 19 ABA2.	445559093220502	216081	W66	Black Top Service, - deep well.	do	01-56	0-65 Qd 65-86 Opl 86-87 Ogl 87-251 Osp 251-280 Ope	899	280	6 in.	_			BR
117.21.19 ABA1.	445559093220501	216082	W67	Black Top Service, - shallow well.	do	12-55	0-78 Qd 78-84 Opl 84-85 Ogl 85-105 Osp	812	105	3 in. 0-84	Opi(?)-Osp	25	12-29-55	
117.21.20 BAC1.	445604093223001	206447	W68	Residence.	Aamot	12-61	0-95 Qd	900	110	2 iņ. 0-90	Qd	40	12-00-61	P
28.24.6 CAA1.	445614093203601	216083	W69	Hedberg-Friedheim - I Block Co.; Wolfe Lake Augmentation Well.	Max Renner	07-47	0-71 Qd 71-78 Opl 78-81 Ogl 81-246 Osp 246-327 Opc	890	327			65	1947	G
28.24 6 BAA1	445653093202601	200539	W70	Park Theatre	do	09-39	0-74 Qd 74-104 Opl 104-229 Osp 229-358 Opc 358-398 €;	905	398	10 in 0-74 8 in. 0-229	Ope-C ₃	46	1939	P

Table 1. Data on selected wells in the St. Louis Park area, Minnesota—Continued

Township and range	Site identification (lat and long)	Minnesota unique well number	USGS project well number	Owner name or other identifiers C	Da Onlier drill		Land surface altitude, in feet	Reported depth of well, in feet	Diameter, in inches, and depth, in feet, of casing	Aquifer(s) open to well bore	Water level, in feet	Date i measured	Field measuremen status
28.24 07 CABI.	445535093203401	200543	W71	Cairns residence	- do03-5	0-70 Qd 70-86 Opl	880	86	4 in. 0-70	Opl	16	03-00-58	
28.24 07 DBA1.	445533093200701	216085	W72	Harder residence — Peder	rson12-5	0-138 Qd 138-153 Osp	925	153	***	Osp			
17.21.19 ACA.		216086	W73	Jasperson Dairy E. H.	. Renner -05-52	0-87 Qd 87-114 Opl 114-120 Ogl 120-144 Osp	915	144	6 in. 0-90.3	Opl-Osp	22	05-22-52	
17 21.08 CAAI.	445721093221801	216087	W74	Landers Gravel McCa	arthy09-2	0-82 Qd 82-100 Opl 100-265 Osp 265-280 Opc	890	280		Opl(?) Osp(?)-Opc	31	09-00-21	AR
8.24 6 BDB1.	445639093203201	216089	W75	Park Pet Hosp Max	Renner1951	0-67 Qd 67-130 Opl-O	884 sp	130	6 in. 0-67	Opl-Osp	33.51	12-11-78	P
8.24 06 ABC1.	445644093202101	216090	W76	Professional	- do1946		882	184	6 in.	Opl(?)-Osp		_	P
17.21.19 CBD1.	445608093240301	216093	W80	Red Owl Keys	10-44	0-99 Qd 99-117 Opi 117-279 Osp 279-397 Opc 397-502 Cj	920	502	16 in. 0-279 12 in. 0-304	Ope	70	10-03-46	-
9.24.30 BCC1.	445916093205101	201039	W82	Weldwood Nursing - Berger Cas	son10-57 swell.	0-56 Qd 56-67 Opl 67-235 Osp 235-348 Opc 348-444 CJ	878	444	12 in. 0-56 6 in. 0-348	(?)-€j	50	11-07-57	
9.24.29 CBC1.	445808093103901	201014	W86	Prudential Layne Insurance Co. No. 1.	e07-54	0-243 Qd 243-257 Osp 257-383 Opc 383-467 Cj 467-470 Csl	925	470	16 in. 0-259	Opc-€sl	78	07-00-54	
17.21 17 BAC2.	445651093722902	149710	W100	Monitoring well E. H.	. Renner -12-78	0-73 Qd 73-88 Opl	910	88	4 in. 0–73	Opl	13 03	12-26-78	0
17.21.16 CDB2	445617093211501	149711	W101	Monitoring well	do12-78	0-100 Qd 100-106 Opl	910	106	4 in. 0–103	Opi	52.41	12-26-78	G,0
		216102	W104	Rice Gravel & Sand	1935			250	12 in.	Opc(?)			

Table 1. Data on selected wells in the St. Louis Park area, Minnesota—Continued

Township and range	Site identification (lat and long)	Minnesota unique well number	USGS project well number	Owner name or other identifiers		late i	Reported log, in feet	Land surface altitude, in feet	Reported depth of well, in feet	Diameter, in inches, and depth, in feet, of casing	Aquiler(s) open to well bore	Water level, in feet	Date measured	Field measurement status
117.21.17 CA1.	***	200979?	W105	Minnesota Sugar Beet Co.	189	9	0-73 Qd 73-93 Opl 93-260 Osp 260-385 Opc 385-504 €j 504-950 €sl-4	! !	950		Opl-€m(?)		***	
28.24.6 CAA2.	445614093204102	216103	W106	Hedberg,		ore 936	0-90 Qd 90-100 Opi 100-230 Osp	900	230		Opl(*)~Osp			
28 24.06 BCD1.	445634093204101	216104	W 107	Interior Elevator Co., Salem Ave. and Chicago & Milwaukee Rail Road tracks.		oui 893	0-75 Qd 75-100 Opt 100-250 Osp 250-390 Opc 390-495 €j 495-710 €l-€ 710-755 €lg		755		Opl(?)-Cig		-	
117.21.21 BAB1.	445605093211201	216029	W 108	5800 Goodneh		ore 936	- .							_
117.21.09 CDC1.	445658093211201	216105	W 109	Max Renner's Shop.		ore 936	0-93 Qd 93-113 Opi 113-118 Osp	925	118	_	Opi(?)-Osp		-	
117.21.16 CCD1.	445609093212501	216107	WIII	6030 Oxford St.		ore 936	0-190 Qd 190-240 Osp	919	240		Osp			G
117.21 16 — CCA1.	445615093212301	206443	W112	Old St. Louis	McCarthy05-	32	0-109 Qd 109-274 Osp 274-398 Opc 398-486 Cj 486-540 Csl	917.52	540	16 in. 0-212 12 in. 194-274	in 1932 Opc-€sl in 1978 Opc	77	12-21-7	/8 G,M
117.21.8 DCB3	445701093215803	206440	W113	St. Louis Park No. 3.	do08-:	39	0-103 Qd 103-118 Opl 118-286 Osp	922	286	24 in. 0-103	Opl-Osp	60	08-00-3	9 P
28.24 6 CAA3	445614093204103	216108	W114	Hedberg,		ore 936	0-60 Qd 60-80 Opl 80-249 Osp	887	249		Opl(*)-Osp			F
117 21.20 ABD1	445554093220301	216109	W115	Monitoring well	Bergerson 02- Caswell.	79	0-65 Qd 65-78 Opl 78-78 Ogl	892 16 M	P 78	4 in. 0-66	Opl	10.85	02-12-7	9 0

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Table 1. Data on selected wells in the St. Louis Park area, Minnesota—Continued

Township and range	Site identification (lat and long)	Minnesota unique well number	USGS project well number	Owner name or other identifiers	Driller	Date drilled	Reported log.	Land surface altitude, in leet	Reported depth of well, in feet	Drameter, in inches, and depth, in feet, of casing	Aquifer(s) open to well bore	Water level, in feet	Date - measured	Field measurement status
117 21.16 DCB3.	445634093205903	160030	W116	do	E. H. Renner	-04-79	0–67 Qd	909.59	67	0–4 in. 0–63	Qd	35.01	06-05-79	0
117 21.16 CDB3.	445617093211502	160031	W117	do	do	-04-79	0-72 Qd	917.73 MP	72	4 in. 0-68	Qd	39.68	06-05-79	0
117.21.20 CDC1.	445516093222501	216088	WIIS	Minneapolis Park — Board- Meadowbrook Golf Course.	do		0-80 Qd 80-89 Opl 89-245 Osp 245-370 Ope 370-485 €j 485-487 €sl	905	487	-	Ope-Cal			-
117.21,20 DAC1.	445527093215201	216009	W119	do	-90 who P 9 wa 40 & 1	-06-35	0-74 Qd 74-82 Opi 82-90 Ogi 90-252 Osp 252-375 Opc 375-465 €j 465-502 €si	890	502	16 in. 0-77 12 in. 77-257	Ope-€si	54.5	06-28-35	-
117.21.16 DCA2.	445014093212802	165516	W120	Monitoring well	E. H. Renner -	-07-79	0-95.5 Qd 95.8-98 Opl, (weathered) 98-107 Opl 107-108.6 Ogl	919.8 MP	105.7	4 in. 0-98	Opl	38.84	07-12-79	G,O
117.21 21 BBD1.	445558093212001	165577	W121	do	do	-07-79	0-110 Qd 110-115 Opi. (weathered) 115-117 Ogi	918	113.25	4 in. 0-109	Opl	53.58	07-18-79	G,O
117 21.21 BADI.	445557093210901	165578	W122	do	do	08-79	0-120 Qd 120-212 Osp 212-239 Ospl	920	239	4 in. 0-217	****			G,0
117.21 21 BBC1.	445559093213201	216129	W140	Cambridge Brick						4 in.	Opl?	_	_	ם
117 21 17 DDD5	445607093214203	216051	W143	6425 Oxford St		********	0-70 Qd 70-90 Opl			4 in. 0–70	Opl			G
28 24.06 BCD2	445634093204102	216128	W144	Interior Elevator		**************************************						_		F .

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702 POST CFF/CL BUILDING	PROVISIONAL RECOILDS	Ple1d Redsurgent	0°0	o.e _		0,0	o	o			0	•	0	6	•	•	•	6	ą	¥	4K, D	a.	413869
	PRO	Date	ł	1-22-81 RECORDS	Yer(slan	1-2-1	18-23-81	19-12-1	1-2-81	19-12-1	19-12-1	1-2-1	1-21-61	18-12-1	2-27-61	1-21-81	1-23-61	12-28-81			8-8-9 8-	7	
		Mater level, in feet	32.91 (below HP)	(below MP)	a paled a	45.04 (below 19)	13.46 (below NP)	46.6 (below PP)	45.20	12.35	35.42	ជៈជ	51.13	.37.42	13.20	35.0	1.63	15.52	PWEY VISION DING		ĸ	ጽ	
		Aquifer(s) open to	140	8		ğ	ê	(B))	7 \$	7	¥	8	Ost	8 ,	8 1	8	7	푱	WATER RESOURCES DIVISION TO POST OFFICE BUILDING	Osprópe	S C	Sp-page	
	thued	Casing	÷6	4 55. 0-74 8:0N	Sign re	4 in. 0-110.5	4.9 3.0	<u> </u>	4 tr. 0-118	\$2 **	4 1n. 0.97.5	- 8 - 8	♣ ts. 0-116	48 40	* 9 25	ij	4 6 3 E	_		8 1a. 6-205	5£.	828 285 285 285 285 285 285 285 285 285	
	rresota—Con	Reported depth of well in feet	103	#1.66 NP BA U.S. GEOLOGICAL SURVEY WATER RESOURCES DIVISIO	STOFFICE BUILD L, MINNESOTA S	27	8	6	ä	38	101	g	ŭ	t.	8	æ	5	PROVISIONAL RECORDS		378	8	121	
	. Lauis Park area, Mirresots—Continued	Lend . Surfles altitude, in feet	909.37 MP	087.66 NP.	BOLST. PAU	912.97 NP	8815 PP	923.84 MP	913.2	9 91.6	915.9	901.8	916.8	916.63	914.6	91518	930.0	PROVIS	ž Í		90015	35	
•	S	1 Joe	# # ##	8888	នទី	888	888	8	25 g	8888	3 5 5	8 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	88	888	я	8	នទីខិ	ş		2888	3888	8888 0	5
•		Driller'	96-101 201-101 -	- 552 - 552 - 552	95 51	251-52 521-52 521-52	548 48	ż	117-12	2577 3243	16-161 161-161	6556	109-12	558 £8	- -	- F	25			A PER	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	10 11 11 11 11 11 11 11 11 11 11 11 11 1	
SULDING OTA 55101	ils and pleasanters in the St	PROVISIONAL I	66-73	€F-30	6 . 1 9	€ -	8 . 1 8	8 E-40	5 6	\$ E	55-01 EF-01	10-73	11-73	11-79	11-73	n-3	12-79	AL RECORDS Reduion		1963	ን አ	۶. ۲۵	413868
WATH I + CONT. CON	on selected wel	ANT BECOUDS	E. H. Nerror	U.S. GECLOGICAL SURVEY WATER RESOURCES DIVISION TO POST OFFICE BUILDING ST. PARIL JUNIOR	49 SEIGH	8	8	8	8	8	8	8	8	8	8	U.B. GEOLOGICAL SURVEY WATER RESOURCES DIVISION 702 POST OFFICE BUILDING	IL MINNESOTA \$5101	PROVISIONAL RI-		Amot	B. N. Reréner	Tri-State Drilling	•
	Table 1.—Cats	Darmer rause of other identifiers	Monttering Well	WATER R	Cable Bol Bering	8	8	8	Monttoring Well	8	8	8	8	8	8	U.S. G WATER I	8 15	Oun Club Well	Monator Drill	Mrn. Rubber	Boss Lake Yards (Milwaukee R.R.)	Honeywell 1	
		(ECCS Project Laber	Z1 A	£1.3	¥ 13	¥ 126	<i>I</i> Z1 A	v 138	£ 12	¥ 130	K 133	V 132	W 133	NEC X	¥ 135	¥ 136	¥ 131	8 >	19. >	28 *	¥	22 >	
		Mirresota unique sell number	169580	165579 1,	227960	165581	165582	165383	165584	165585	165386	165587	165586	165589	165590	165591	169592	227957	227301	227959	196122	203892	
		Site identification (latitude and langitude)]	PAG1703333362 165573.55 PADVISIONAL	44555693214201	445551093203501	445523093203902	44555693212002	445543093212101	445555093214501 ,	445634093218101	445600093213701	445617093212002	24561709321.2003	445557093210802	***************************************	445615093220903	445554093231501	19521093215301	145615093211601	145626093204201	445958093213901	
•	•	Township and	117-21-16	20.2. 20.0 20.0.	117.21.20	028_24_07 BYSE	021.24.07 CDB2	117.21.22 BBD2	11,21,21 1521	117.21.20 AND2	भूत स्थान १८५५ १८५	117-21.21 Febri	17.21.16	117.21.16 553	117.2.2 1802	117.21.16 Ext3	117.2.17	117.21.19	71.2.17	117.21.16	DALZLOS CRAI	15.12.31 1960	

Township and, range	Site identification Lat - Long	Minnesota unique well number	USGS pro- ject well number	Land surface altitude PROVISION Subject	M.P. alti- tude (as of Mar. 1982) AL RECORDS to Ravision	Well depth	diam	Casing - depth 	Hydrolog Geologic logs	gic unit Open to well bore (wells screened near water table are designated Wt)	Remarks
117N21W17CBD2 117N21W17DDA1 117N21W17DCD1 118N21W31BCC1 117N21W07CBA1	445625093223602 445616093214301 445607093220401 445717093235601	216110 216111 216112 216113 216114	P1 P2 P3 P4 P5	920.8 892.2 900.0 930	929.9 920.94 892.50 900 932.7	50 23 47	11	0-48 0-21 0-45	0-50 Qd 0-52 Qd 0-47 Qd	48-50 Qb Qb 21-23 Wt	Destroyed Installed by Barr Engineering Co. Destroyed 1% inches x 2 feet x 10 slot screen
0 28N 24W1 8DBB1 117N 21W1 7CDC2 117N 21W1 7DCA4 117N 21W1 7CDD3 117N 21W1 7DDA2	445442093202601 445610093222601 445614093220304 445607093222103 445616093214302	216115 216116 216117 216118 216119	P6 P7 P8 P9 P10	880 890.5 890.4 891.4 921.9	881.18 889.59 892.43 893.85 923.89	18 11 131 491	11/2 11/2 11/2	0-16 0-9 0-112 0-472	0~18 Qd 0-11 Qd 0-15 Qd 0-50 Qd	16-18 Wt Opt 9-11 Wt 111-131 Wt 471-491 Wt	Do
117N21W17DDB1 117N21W17DBB1 117N21W17BDD1 117N21W17DCA5 117N21W17DCA6	445614093215303 445628093220901 445633093221801 445614093220305 445614093220306	216120 216121 216122 216123 216124	P11 P12 P13 P14 P15	896.0 899.5 894.3 890.3	897.80 903.43 896.93 893.33 893.06	14 40 62 42 67	11 11 12 12 12	0-12 0-38 0-60 0-40 0-65	0-16 Qd 0-42 Qd 0-72 Qd 0-50 Qd 0-67 Qd	12-14 Wt 38-40 QM 60-62 Qb 40-42 QM 65-67 Qb	Permanently sealed Permanently sealed 14 inches x 2 feet x 10 slot screen 14 inches x 2 feet x 12 slot screen
117N 21W16DCB1 117N 21W16DCB2	445634093205901 445634093205902	227902 227903	P16 P17	906.3 906.2	909.33 909.43	35 94 <u>1</u>	1 1 1 1	0-33 0-9 2 1	0-37 Qd 0-911 Qd	33-35 Wt 921-941 Op1 <	li inches x 2 feet x 10 slot screen li inches x 2 feet x 8 slot screen
117N21W16CD34 117N21W2OABD2 117N21W2OABD3	445617093211503 445554093220302 445554093220303	227904 227905 227906	P18 P19 P20 VISIONA	915.1 889.0 889.0 L RECORDS	915.73 890.73 890.11	42 7 15	1± 1± 1±	0-40 0-5 0-13	911-941 Op1 0-42 Qd 0-7 Qd 0-23 Qd	40-42 QM 3-5 Wt 13-15 Wt	1% inches x 2 feet x 10 slot screen Do Do
117N 21W1 7AAB2 117N 21W1 7ACD1 117N 21W1 7BAC3 117N 21W1 7CAA2 117N 21W1 7CAA2	445654093235502 445637093215701 445651093222903 445630093222102 44562093221902			896.7 894.4 890.4	923.75 918.44 898.71 895.89 892.21	42½ 35 14 14½ 7	11 11 11 11 11	0-401 0-33 0-12 0-121 0-5	0-421 Qd 0-36 Qd 0-15 Qd 0-15 Qd 0-15 Qd	401-421 Wt 33-35 Wt 12-14 Wt 121-141 Wt 5-7 Wt	Do Do PROVISIONAL RECC Subject to Revision Do
117N21W17DCB2 117N21W16BDD1 117N21W16CBA1 117N21W18CAD1 117N21W18DDB1	445615093220902 445632093210001 445631093212001 445619093232701 445618093230501	227912 227913 227914 227915 227916	P26 P27 P28 P29 P30	889.4 886.8 909.5 908.3	890.51 889.12 911.30 907.31 910.05	41 17 32 15 21	12 12 12 12 14	0-21 0-15 0-30 0-13 0-19	0-41 Qd 0-17 Qd 0-42 Qd 0-15 Qd 0-21 Qd	21-41 Wt 15-17 Wt 30-32 Wt 13-15 Wt 19-21 Wt	Destroyed 1% inches x 2 feet x 10 slot screen Do Do Do Do
117N 21W1 8CDA1 117N 21W1 8BDD1 117N 21W1 8DBA1 117N 21W1 7BCD1 117N 21W1 7CBD1	445618093233101 445633093232801 445631093231101 445634093223501 445621093223201	227917 227918 227919 227920 227921	P31 P32 P33 P34 P35.	909.8 919.5 908.2 927.4 923.9	911.59 921.34 909.32 929.82 927.54	21 28 22 52 47	1 	0-19 0-26 0-20 0-50 0-45	0-27 Qd 0-32 Qd 0-22 Qd 0-52 Qd 0-52 Qd	19-21 Wt 26-28 Wt 20-22 Wt 50-52 Wt 45-47 Wt	Destroyed li inches x 2 feet x 10 slot screen li inches x 2 feet x 40 slot screen Do li inches x 2 feet x 10 slot screen
117N21W16BBA1 117N21W09CAC1 117N21W08DAC1 117N21W08CBD1 117N21W07DDA1	445653093212001 445711093211501 445712093215601 445714093223801 445710083225901	227922 227923 227924 227925 227926	P36 P37 P38 P39 P40	915.3 896.1 922.2 904.6 908.7	918.76 889.12 924.63 905.64 909.98	471 161 481 22 15	1	0.45± 0-14± 0-46± 0-10 0-13	0-471 Qd 0-161 Qd 0-49 Qd 0-22 Qd 0-15 Qd	451-471 Wt 141-161 Wt 461-481 Wt 20-22 Wt 13-15 Wt	Do Do Do Po Provisional rec
117N 21W1 8ABC1 117N 21W20ACC1 117N 21W20DBB1 117N 21W20DAA1 117N 21W16DCA1	445648093231801 445546093221301 445539093221401 445538093214301 445614093212801	227927 227928 227929 227930 227931	P41 P42 P43 P45	911.6 898.3 893.4 895.9 917.8	913.38 899.94 894.74 897.04 920.30	21 21½ 14½ 15 41½	14 14 14 14	0-19 0-19 0-12 0-13 0-39	0-32 Qd 0-22 Qd 0-15 Qd 0-16 Qd 0-42 Qd	19-21 Wt 191-211 Wt 121-141 Wt 13-15 Wt 391-411 Wt	Do Do Do Destroyed

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MINNE	30TA 55101										Outjett to Nevision
Township and range PROVISION Subject to	Site identification Lat - Long AL RECORDS e Revision	Minnesota unique well number	USGS pro- ject well number	Land surface altitude	M.P. alti- tude (as of Mar. 1982)	Well depth	diam- eter	asing depth (feet)		tc unit Open to well bore (wells screened near water table are designated Wt)	Remarks
029N24W31DBB1 028N24W06CAD1 028N24W06BAB1 028N24W07BDC1 028N24W07CDB1	445716093202001 445617093202601 445651093203601 445543093203101 445523093203901	227932 227933 227934 227935 227936	P46 P47 P48 P49 P50	871.8 884.6 879.4 907.7 878.4	873.98 886.57 881.18 910.17 879.44	101 21 14 45 15	14 14 14 14	0-81 0-19 0-12 0-43 0-13	0-101 Qd 0-22 Qd 0-22 Qd 0-45 Qd 0-15 Qd	81-101 Wt 19-21 Wt 12-14 Wt 43-45 Wt 13-15 Wt	li inches x 2 feet x 10 slot screen Do Do Do Do Do
117N21W21CDB1 028N24W05CDA1 029N24W32CCD1 028N24W20ADD1 029N24W31DAA1	445525093211701 44561509319120* 445656093192901 445358093193901 445720093194701	227937 227938 227939 227940 227941	P51 P52 P53 P54 P55	899.8 861 870 858 868	901.54 863 872 860 871	18 14 31 18 23}	14 14 14 14	0-16 0-12 0-29 0-16 0-21}	0-18 Qd 0-14 Qd 0-32 Qd 0-18 Qd 0-28 Qd	16-18 Wt 12-14 Wt 29-31 Wt 16-18 Wt 211-231 Wt	Do Do Do Do
028N24W04AAD1 028N24W16ABB1 117N21W20ABD4 117N21W17CAC3 029N24W31DAA1	445642093172501 445510093175301 445559093220204 445620093222602 445548093221501	227942 227943 227944 227945 227946	P56 P57 P58 P59 P60	860 890.5 892 892	860 891.46 893.96 894.38	47 12 12 10 10	14 14 14 14	0-45 0-10 0-10 0-8 0-8	0-52 Qd 0-171 Qd 0-12 Qd 0-12 Qd 0-10 Qd	45-47 Wt 10-12 Wt 10-12 Wt 8-10 Wt 8-10 Wt	Do Do Do Destroyed (removed) 1% inches x 2 feet x 10 slot screen
117N21W16CCA1 028N24W07BDB2 117N21W16BCC2 117N21W20AAD3 117N21W21BBB2	445617093212001 445551093203502 445634093213102 445555093214502 445600093213702	227947 227948 227949 227950 227951	P61 P62 P63 P64 P65	917.1 909.8 915.9 891.7 901.7	921.42 910.40 916.71 892.51 904.11	47 43 46 15 28	14 14 14 14	0-45 0-41 0-44 0-13 0-26	0-47 Qd 0-47 Qd 0-47 Qd 0-15 Qd 0-28 Qd	13-15 WE WATER	GEOLOGICAL CUFY- DO DO PROVISIONAL RECUIR DO PROVISIONAL RECUIR DO Subject to Revision
117N21W16CDA4 117N21W21BCD2 117N21W16BCC4 117N21W17DBC2 117N21W17CBD2	445617093211002 445543093212102 445634093213104 445624093220802 445621093223202	227952 227953 227954 227955 227956	P66 P67 P68 P69 P100	906.1 913.2 915.8 907.1 924.2	908.62 914 918.45 908.51 925.45	411 211 38 24 67	12 12 12 12	0-411 0-191 0-36 0-22 0-65	0-42 Qd 0-22 Qd 0-38 Qd 0-26 Qd 0-67 Qd	391-411 Wt 191-211 Wt 36-38 Wt 22-24 Wt 65-67 QM	UL MINNESOTA 55101 Do Do Do Do Do Do Do Do Do D
117N21W17CBD3	445621093223203	216200	P101	923.3	925.38	103	18	0-101	0-981 Qd 981-1 9 3 Op1	101-103 Op1	Do Screen gravel packed
117N21W16CCA4	445617093212004	216199	P102	917.1	919.57	107	11	0-105	0-108 Qd 108-109 Ogl	105-107 Qb	li inches x 2 feet x10 slot screen Screen gravel packed
117N21W17BAC4	445651093223001	216198	P103	895.5	896.38	94	14	0-73	0-73 Qd 73-88 Opl 88-90 Ogl	73-82 Opl	Open hole
117N21W17BAC5 117N21W17BAC6	445651093223002 445651093223003	216197 216196	P104 P105	895.1 895.4	895.84 896.20	33 61	11 11	0-31 0-59	90-94 Osp 0-34 Qd 0-61 Qd	31-33 QM 59-61 Qb	le inches x 2 feet x 10 slot screen Do
117N21W17BAC7 117N21W20AAB2 117N21W20AAB3 117N21W21BBB2	445651093222904 445605093215102 445605093215102 445600093213703	216195 216194 216193 216165	P106 P109 P110 P111	896.5 892.5 892.5 902.0	897.02 892.69 892.56 902.70	64 <u>1</u> 44 12 <u>1</u> 78	11 12 11 11	0-621 0-42 0-108/2 0-76	0-65 Qd 0-44//Qd 0-128-Qd 0-79 Qd	621-641 Qb 42-44 QM 101-121 Wt 786-78 Opl Gr	Do Do Do Do
117N21W21B9B3	445600093213704	216166	P112	902.2	903.47	50	11	0-48	79- Opl 0-51 Qd	48-50 QM	_ Do
117N21W21BAD3	445557093210903	216167	P113	915.3	916.88	210	11	0-201 (#1-1)C	0-114 Qd 207-210 <	201-207 Osp 214-212 Osp.	lt inches x 6 feet x 10 slot screen 3-foot casing below screen, cap on end
117N21W21BAD4 028N24W06CAD3	445557093210904 445617093202603	216168 216169	P114 P116	915.2 885.1	915.62 885.08	55 91}	1 i 1 i	0-53 0-89	0-55 Qd 0-69 Qd 69-79 Opl	53-55 Wt g ₁ , .,,t _n Osp	le inches x 2 feeta-10 slot screen le inches x 2 feet x 10 slot screen Gravel pack to 10 feet below
2	PROVISIONAL RECO	COR							79-801 Ogl 801-911 Osp		surface

413856

U S GEOLOGICAL SURVEY WATER RESOURCES DIVISION 702 POST OFFICE BUILDING ST. PAUL, MINNESOTA 55101

PROVISIONAL RECORDS Subject to Revision

'ownship and range	identification Lat - Long PROVISIONAL RECORDS	Minnesota unique well number	USGS pro- ject well number	Land surface altitude	M.P. alti- tude (as of Mar. 1982)	Well depth	diam- eter	depth	Hydrol Geologic logs	ogic unit Open to w bore (wel screened water tabl designated	ls near e are	Remarks
	Subject to Revision	<u> </u>						3		····		
128N24W6CAD4	445617093202604	216170	P117	885.2	887.41	33	11	0-Z0}	0-33 Qd	g, 43	QM	12 inches x 2 feet x 10 slot screen
•										2		Gravel pack and grouted from above
.17N21W17DDB	4 445614093215304	216171	P118	896.0	896.96	72.5	11	0-70}	0-65 94	701-721	ðpl	le inches x 2 feet x 10 slot screen
									65-85 Op 85-871 Og	1		المعامل المعالم
.17N21W17DDB	5 445614093215305	216172	P119	895.7	896.24	44.5	11	0-423	0-441 Qd	421-441	QM	1% inches x 2 feet& 10 slot screen
,												Grouted above point to 10 feet be- low surface 55.117
117N21W17DDB	6 445614093215306	216173	P120	896.0	896,-34	62	14	0-6 0	0-62 Qd	60-62	QM	lt inches x 2 feet x 10 slot screen
117N21W17DCB	4 445614093220601	216174	P121	889.5	889.89	82.5		0-67	0-641 Qd 641-82 Op		Op1	Open hole
									6. 6.4 Cs			
117N21W17DCB		216175	P122	890.6	891.28	35	14	0-33	0-36 94	33-35	QM	li inches x 2 feet x 10 slot screen
117N21W17DCB 117N21W17DCB		216176 216177	P123 P124	889.4 889.4	891.01 891.83	24 58	11 11 11	0-22 0-56	0-24 Qd 0-61 Qd	22-24 56-58	QM QM	Do Do
117N21W17DCB		227958	P134			58 68	îi	0-56 0-66	0-68 04	-:	Qb _	14 inches x 2 feet x 10 slot screen
1 = 2/4 17 BAL		216192	مين ۾ دي		_	. 7	, الإ	c . 24 %	يت ۲۰ د		úŧ	\ (Pelnt'is not open - grout probably
74 21 12 18 DAG	2 445. 5227,0302	127466	213,-	_	_				٠.			around openings)
/ / 2 / 2 / 0 0			1	_	-	32r	4/4	1. 205	ان دعاران			The state of the s
									ات له کرد. - ۲۱۵ ته:	4	طور	14 ichos . 3 tee- a 10 slot serven. Enter 1.
	אור באר באר באר באר באר באר באר באר באר בא	מברמנ							والمحر المواع			- <u>-</u>
	Subject to Revisi	001100					•			•		196

TABLE 2. HISTORICAL ST. PETER PAH DATA

		To	otal PAH, ng/l			
				4.5	Document No.	Analytical
<u>Well</u>	<u>Date</u>	Other PAH	Carcinogenic PAH	<u>Lab</u> (a)	or Reference	<u>Method</u>
SLP3	11/78	0	0	MDH	475510	HPLC
SLP3	1/29/80	36	30	MDH	6610438	HPLC
SLP3	5/20/80	20	0	MDH	6610438	HPLC
SLP3	7/3/80	0.9	0	MDH	6610438	HPLC
SLP3	1/28/81	0	0	MDH	6610438	HPLC
SLP3	8/11/81	304	0	MDH	96168	HPLC
SLP3	1/15/82	0	0	Capsule	50006352	Resin/GCMS
SLP3	2/21/84	0	0	Pace/RMA	SLP RFQ	Resin/GCMS
SLP3	5/31/84	0	0	Pace/RMA	SLP RFQ	Resin/GCMS
SLP3	6/27/84	0	0	Pace/RMA	SLP RFQ	Resin/GCMS
SLP3	7/25/84	0	0	Pace/RMA	SLP RFQ	Resin/GCMS
SLP3	11/15-28/84	0	0	Pace/RMA	SLP RFQ	Resin/GCMS
W14	5/21/80	1,002	14	MDH	96168	HPLC
W14	12/14/84	514	18,	TCT	1/31/85 report	GCMS
W14	12/14/84	0/0 ^(b)	_{0/0} (b)	Acurex	4/5/85 report	cartridge/GCMS
W24	5/21/80	9,855	180	MDH	96168	HPLC
W24	12/10/84	6,165(5,075)(c)	27(20)(c)	TCT	1/31/85 report	GCMS
W24	12/10/84	1,990/2,090 ^(b)	0/0(b)	Acurex	4/22/85 report	cartridge/GCMS
W33	6/5/79	4.1	6.6	MDH	ERT 1983 report	HPLC
					App. B	
W122	6/26/80	59	31.5	MDH	96168	HPLC
W129	6/24/80	204	8.9	MDH		HPLC
W133	5/30/80	1,765	121	MDH	96168	HPLC
W133	2/6/81	669	65	MRI	800021	HPLC
W133	2/6/81	0	0	MRI	800013	GCMS
W133	12/12/84	3,650	0	Acurex	5/14/85 report	GCMS
P116	5/28/80	0	0	MDH	96168	HPLC

MRI = Midwest Research Institute (a)

MDH = Minnesota Department of Health

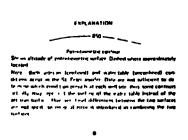
Capsule = Capsule Laboratories Pace = Pace Laboratories, Inc.

TCT = Twin City Testing, Inc.

RMA = Rocky Mountain Analytical

Acurex = Acurex Corporation

- (b) Duplicate samples.
- Numbers in parentheses are corrected for field blank. (c)



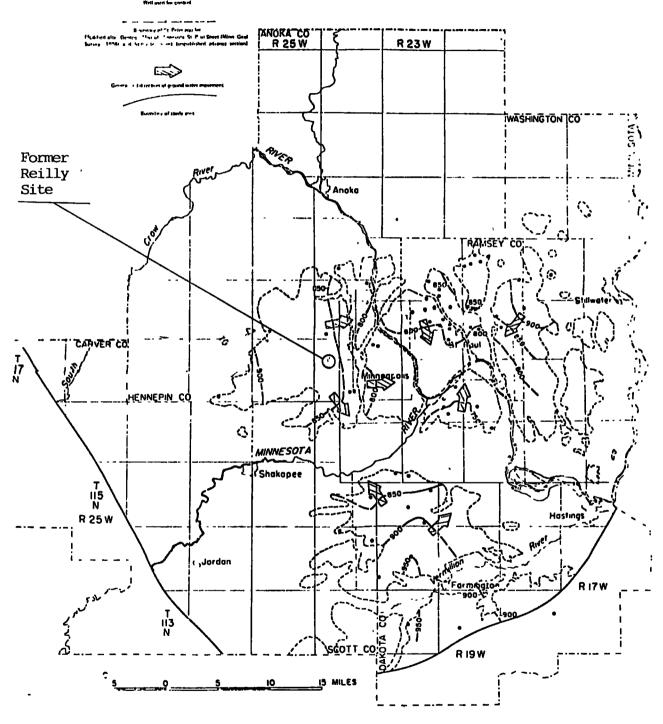


Figure 6. - Potentionmetric surface of water in the St. Peter aquifer in Winter 1970-71 in the Metropolitan Area.

(From Norvitch, et. al., 1974)

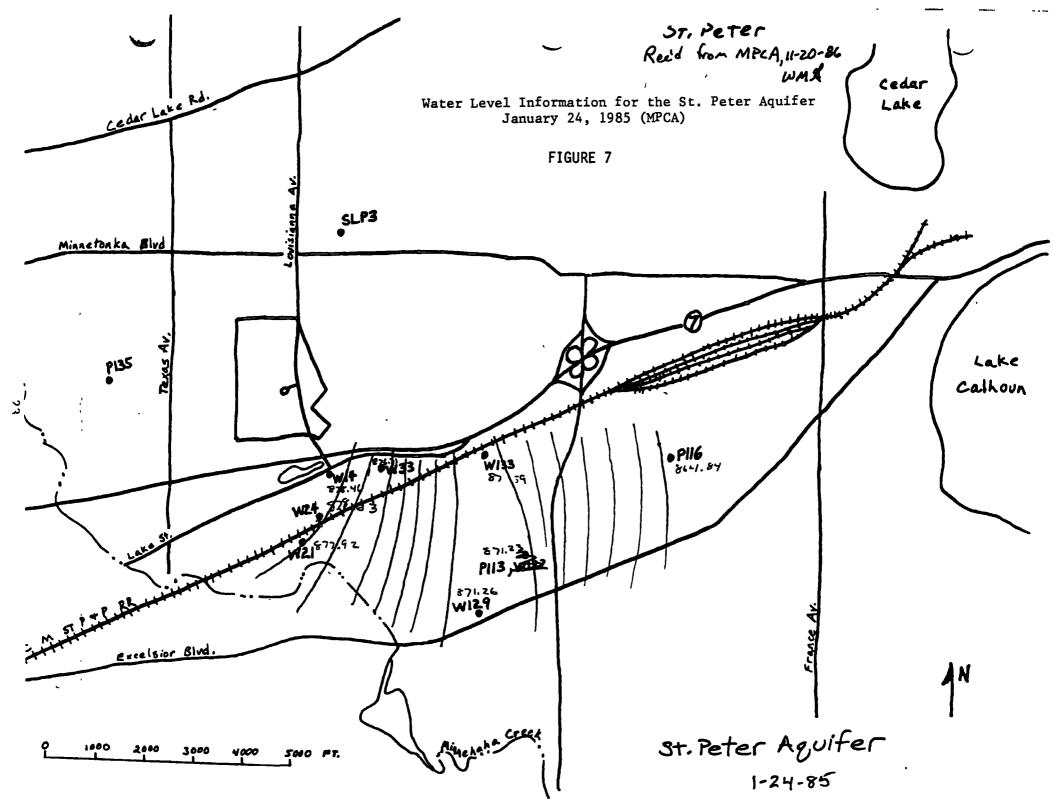
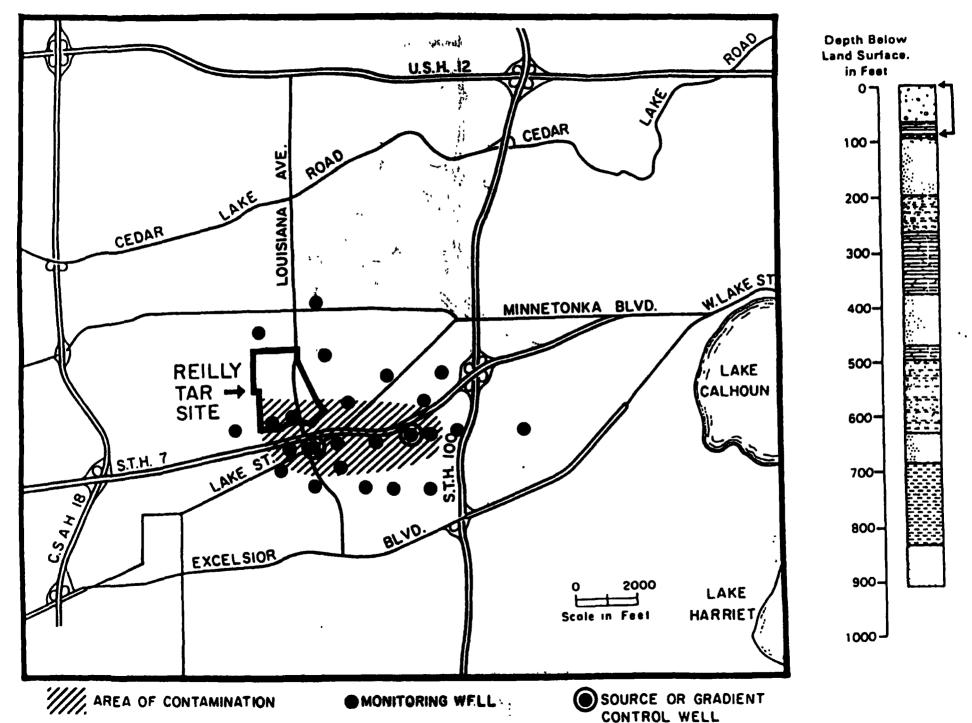


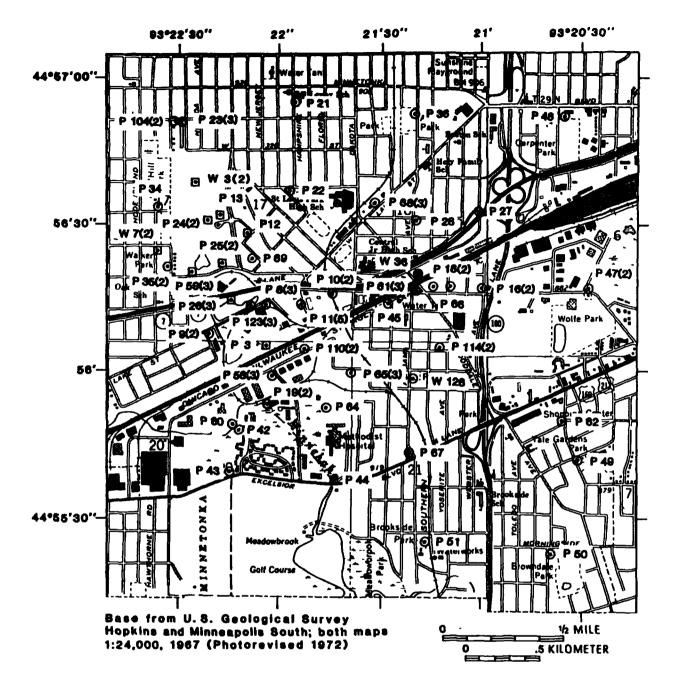
TABLE 3. MPCA ST. PETER WATER LEVEL DATA

DATE	LOCATION	WELL	WATERELE	AQUIFER
1724785	4	P 116	864.84	OSTP
1/24/85	9	W 133	871.59	OSTP
1/24/85	11	W 122		OSTP
1/24/85	11	P 113	871.23	OSTP
1/24/85	13	W 129	871.26	OSTP
1/24/85	19	W 21	877. 92	0STP
1/24/85	24	W 14	878.46	OSTP
1/24/85	26	W 33	876.31	OSTP
1/24/85	31	W 24	878.63	CSTP

Figure 8. DRIFT A ND PLATTEVILLE AQ JIFERS



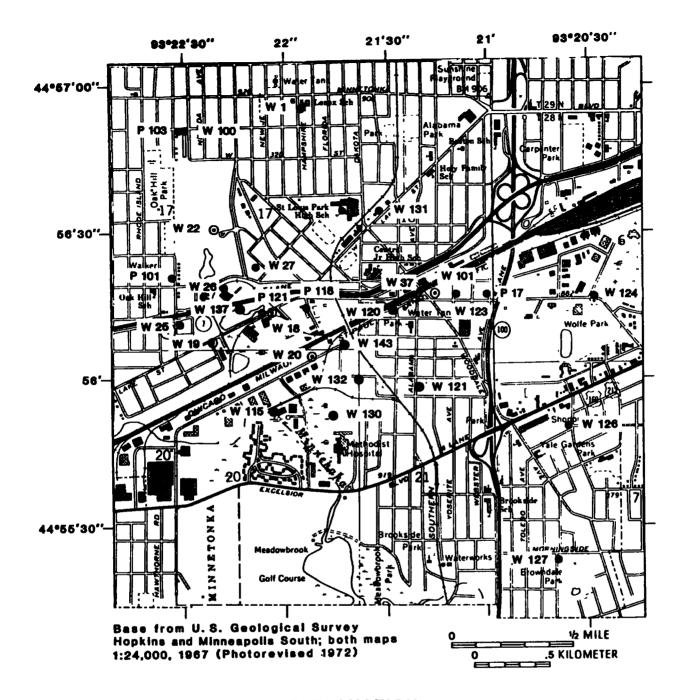
From MPCA Citizen's Board Meeting 4-22-86 (Agenda Item).



EXPLANATION

- P11(5) Location and project well number. At clusters where more than one well is completed in drift, the project well number of the shallowest well is shown and the total number of wells completed in drift at that location is shown in parentheses.
- P59(3) Square indicates that one or more wells at cluster have been permanently sealed, damaged, or destroyed.

Figure 9. Location of Observation Wells Completed in the Drift.



EXPLANATION

- W 27 Location and project well number of well completed in Platteville aquifer

Figure 10 Location of observation wells completed in the Platteville aguifer

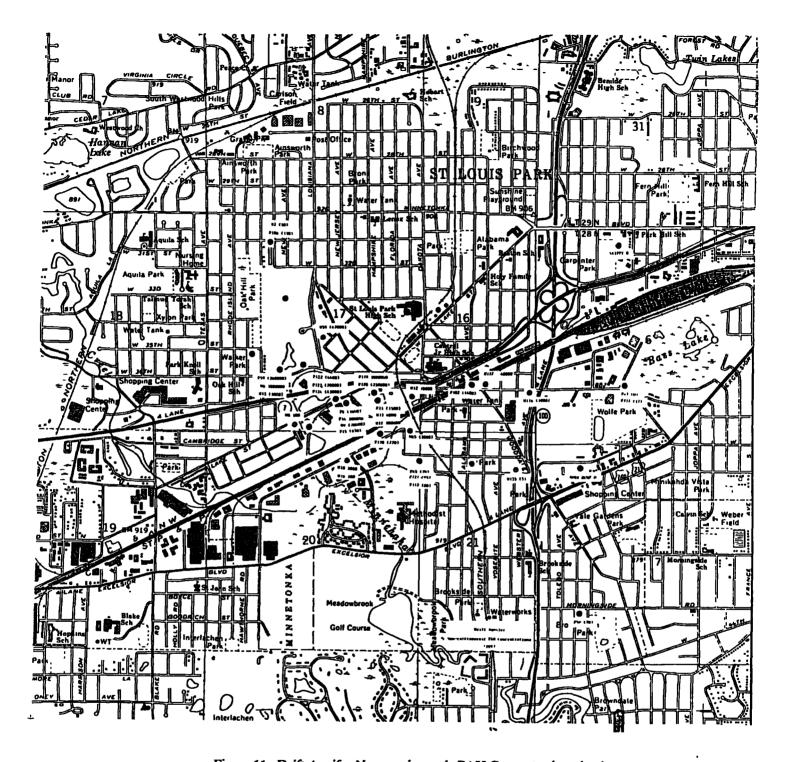


Figure 11 Drift Aquiser Non-carcinogenic PAH Concentrations (ppt)

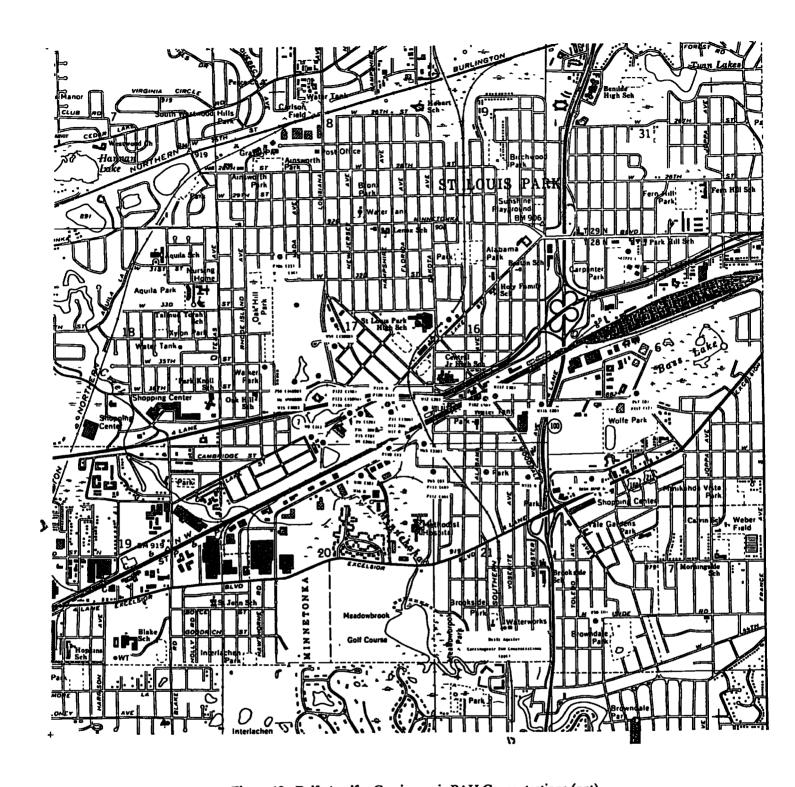


Figure 12 Drift Aquifer Carcinogenic PAH Concentrations (ppt)

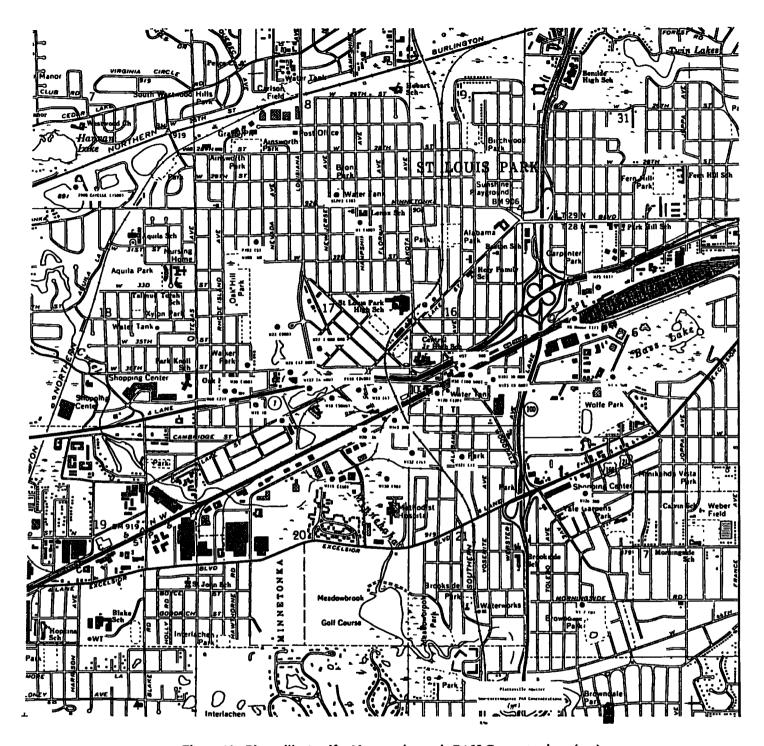


Figure 13 Platteville Aquifer Non-carcinogenic PAH Concentrations (ppt)

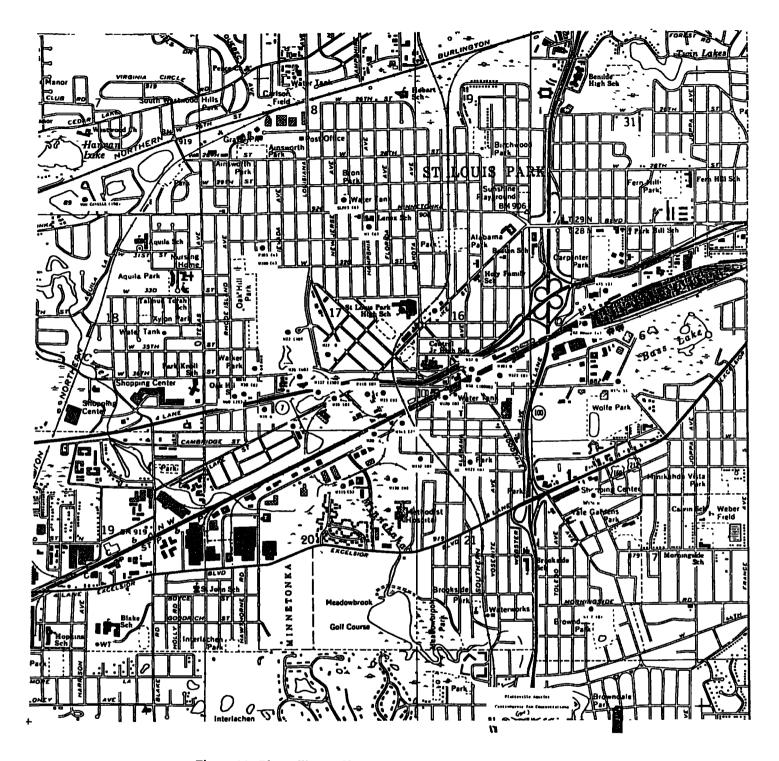


Figure 14 Platteville Aquifer Carcinogenic PAH Concentrations (ppt)

TABLE 4 RESULTS OF PAH AND PHENOLICS ANALYSES FOR DRIFT WELLS(8)

1				Phenolic	cs in parts per b			
Well Number	Sample Collection	PAH in part Non-Carcinogenic	S per trillion Carcinogenic (b)	GC/MS	MBTH/4 AAP	Method <u>Unknown</u>	Document Number	Data Source
, P8	05-Jun-80	1,602	123	0	10		9611321	HDH
,	Мар	(1600)	(120)			(10)		
Pli	02-Jun-80	1,540	1,258	0	9.5		9611331	МĎН
	Мар	(1500)	(1300)			(10)		
P14	05-Jun-80	126,730	o	572	8,000		9611341	НФН
· P14	Feb-81	10,7000,000 ^(c)				10,700	515700	EHRLICH 1982
" P14	11-Mar-81	320,000	0	0			800016	MRI
P14 ⁽¹⁾	10-Jun-81	300,000	850				6641413	USGS
P14	12-Jan-84			2,000	3,600		9629556	MPCA
P14	17-Jan-84			2,200	3,500		9629557	MPCA
	MAP	300,000	300			2,000		
Pl5	04-Jun-80	654	71	360 '	130			MDH
•	MAP	(650)	(70)			(200)		
P47	28-May-80	0	0	0	2		9611203	MDH
i	MAP	(0)	(0)			(2)		
, P20	23-Jun-80	70	0		13		9611373	MDH
	MAP	(70)	(0)			(13)		
P59	28-Ju1-80	363,580	13,890		6,300		9611376	MDH
	MAP	(360,000)	(14,000)			(6,300)		
P65	26-Jun-80	71.2	0	0	4		9611380	MDR
1	HAP	(70)	(0)			(4)		
P102	30-May-80	1,353	53	0	8		9611387	MDH
7	MAP	(1400)	(50)			(8)		

	Ca1-	DAM !						
Well Number	Sample Collection	Non-Carcinogenic	Carcinogenic (D)	GC/MS	MBTH/4 AAP	Method <u>Unknown</u>	Document Number	Data Source
P106	30-Jun-80	128.5	13	0	3.4		9611316	MDH
	MAP	(130)	(13)			(3)		
P109	26-Jul-80				20		9611286	MDH
	MAP	-	-			(20)		
P110	02-Jul-80	773.7	8.4	0	0		9611397	MDH
	MAP	(770)	(8)			(0)		
P111	26-Jun-80	95.2	41.8	0	4.5		9611401	MDH
	MAP	(95)	(40)			(5)		
2112	27-Jun-80 MAP	79.2 (80)	10.8 (10)	0	9	(1.0)	9611401	MDH
	MAP	(80)	(10)			(10)		
2117	28-May-80	0	0	0	2.6		9611203	MDH
	01-Sep-83				9.4		9611022	MPCA
	16-Ju1-80	17.4	12.5					MDH
	MAP	(17)	(12)			(6)		
119	03-Jun-80	2,565	0	0	200		9611413	MDH
	01-Feb-81	2,400,000 ^(c)		0			51 5700	EHRLICH 198:
	MAP	1,000,000	0			(200)		
1 20	03-Jun-80	247,822	52	0	360		9611415	MDH
	MAP	(250,000)	(52)			(360)	•	
1 22	12-Jun-80	4,411	189	0	7,500			MDH
	MAP	(4,400)	(190)			(7,500)		
123	10-Jun-80	69,300	14,870	524	7,300		9611426	МДН
	MAP	(70,000)	(15,000)			(7,300)		



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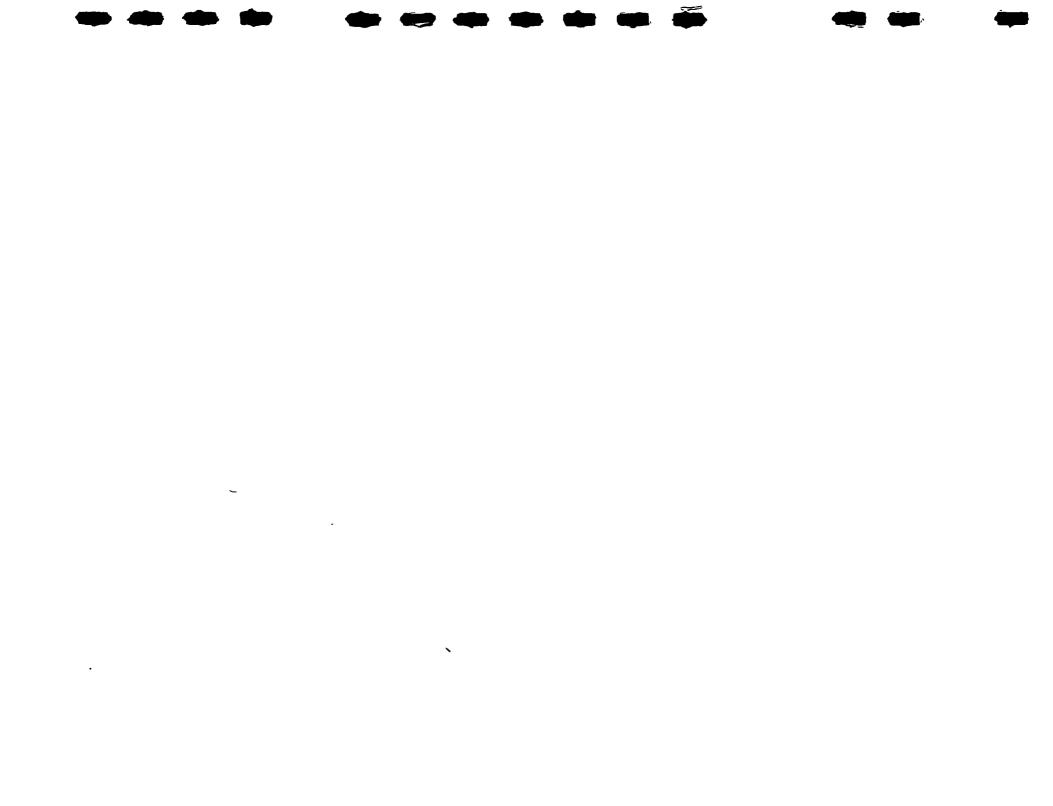
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*****	Well Sample PAH in parts per trillion				cs in parts per bi			
Number	Collection	Non-Carcinogenic	Carcinogenic (b)	GC/MS	MBTH/4 AAP	Method Unknown	Document Number	Data Source
P1 24	10~Jun-80	42,520	0	499	3,000		9611430	MDH
	MAP	(43,000)	(0)			(3,000)		
BURN DUMP	23-Dec-83	0	0					MRC
	MAP	0	0			~		
HABCO ^(d)	27-Jun-75					340	7600462	MDH
	MAP	-	-			(340)		
SKIPPY	23-Dec-83	0	0					MRC
	MAP	0	0			-		
W2	12 4 76				0		404579	20.00
WZ	12-Apr-76				U	0		BARR MDH
	25-May-77 26-May-77				0	U	6100228 404579	BARR
	29-Mar-79	0	0		5		9402583	MDH
	30-Jun-80	8	12	0	4.4		9611316	MDH
	01-Jun-80	· ·		· ·	***	5	515700	EHRLICH 1982
	15-Ju1-80	73.1	2.5			-	9611278	MDH
	12-Dec - 80	52.1	372.1					MDH
	06-Feb-81	690	0	0			80000	MRI
	09-Sep-82	32	0				534015	CH2M HILL
	07-Nov-82	18	0				534015	CH2M HILL
	MAP	(50)	(10)			(5)		
W3	26-May-77				0		404 589	BARR
	MAP					0		
W 5	08-Apr-76				153		404579	BARR
	25-May-77					35	6100228	MDH
	26-Hay-77				22		404579	BARR
	02-Jun-77				28		404579 9402559	BARR
	29-Mar-79 MAP	_	_		9.4	(30)	7402737	MDH
	FINE	_	_			()0)		

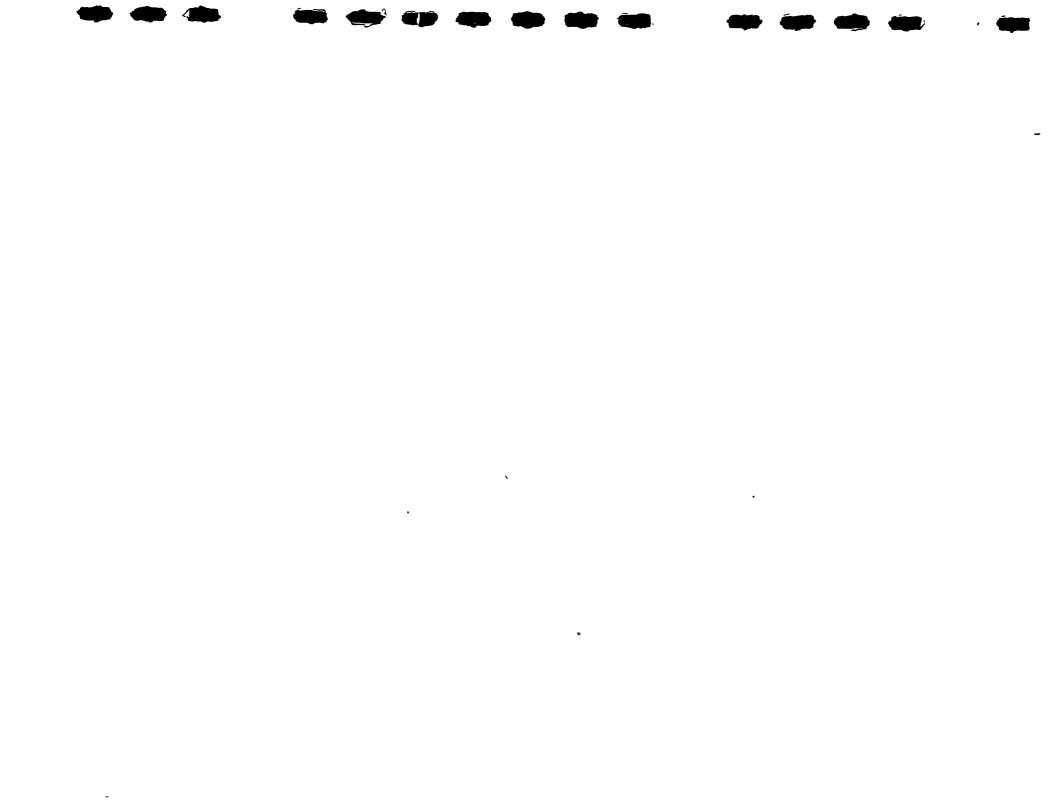
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	_			Phenolic	s in parts per bi			
Well Number	Sample Collection	PAH in parts Non-Carcinogenic	per trillion Carcinogenic (b)	GC/MS	MBTH/4 AAP	Method <u>Unknown</u>	Document Number	Data Source
W6	08-Apr-76				43		404579	BARR
•	25-May-77					190	6100228	MDH
1	26-May-77				88			BARR
•	02-Jun-77				50		404 579	BARR
	01-Mar-79	12,400,000	1,000,000			100	WSP2211	HULT 1981
•	03-Apr-79	1,000,000	1,000,000		93		9402618	MDH _
	28-Jul-80				22		9611320	MDH
	MAP	1,000,000	1,000,000			100		
W7	06-Apr-76				0		404579	BARR
	17-Jan-84			170	340		9629557	MPCA
1	MAP	-	-		2.0	200		
ń8	12-Apr-76				0		404579	BARR
	25-May-77					0	6100228	MDH
	26-May-77				0		404579	BARR
ı	10 -A pr-79	5,630	0		9		9402639	MDH
	22-Jul-80	- 28	14		3.4		9611280	MDH
ı.	MAP	(100)	(14)			9		
hð	01 <i>-</i> Apr-76				3,000		404579	BARR
F. 7	25-Kay-77				•	1,100	6100228	MDH
	26-May-77				600			BARR
1	31-Hay-77	0	0				404788	USEPA (BARR)
4	02-Jun-77				600		404579	BARR
,	18-Feb-77				760		404579	BARR
	28-Mar-79				110		9402551	MDH
į.	05-Jun-80(10 MIN	1) 20,846	0	0	290		9611323	MDH
1	05-Jun-80	6,799	600	0	86		9611323	MDH
4	19-Jan-84			350	840		9629559	MPCA
l,	MAP	(10,000)	(200)			(800)		

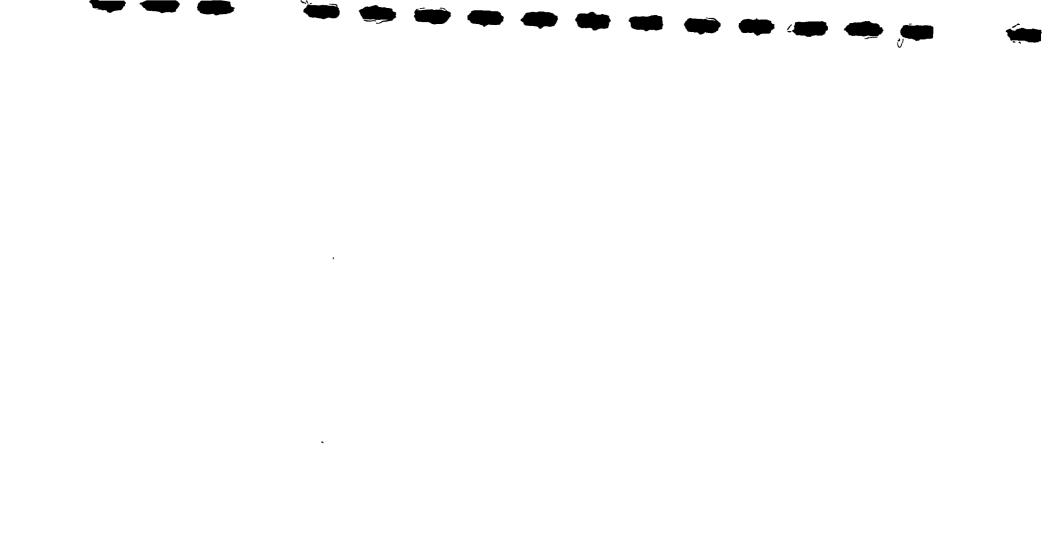


			_		Phenolic	s in parts per bi			•
	Well Number	Sample Collection	PAH in parte Non-Carcinogenic	Carcinogenic (b)	GC/MS	MBTH/4 AAP	Me thod Unknown	Document Number	Data Source
-	MIO	01-Apr-76		•		0		404579	BARR
	4	25-May-77					17,000	6100229	MDH
		26-May-77				4		404579	BARR
	ai	01-Mar-79	3,100	0			6	WSP2211	HULT 1981
	•	05-Apr-79	2,458	0		4.8	•	9402625	MDH
	ī	23-Ju1-80	292	30.4		15.7			MDH
		23-Dec-83	0	0					MRC
		MAP	3,000	(10)			5		
	W11	09-Dec-76				22		404579	BARR
		25-May-77					23	6100229	MDH
		26-May-77				4		404579	BARR
		01-Mar-79	4,000	100			4	WSP2211	HULT 1981
		03-Apr-79	4,650	206		3.8		9402618	MDH
		02-Jun-80	1,290	82	0	9		9611336	MDH
36		15-Dec-83	·		2.6	16		9628657	MPCA
	η 	МАР	4,000	200			10		
	W12	10-Dec-76				14		404579	BARR
	i	10-Apr-79	.908,260	110		26		9402639	MDH
	N	04-Jun-80	6,375	64	0	36		9611282	HDH
	1	25-Jun-80	2.3	0	0	3.8			MDH
		01-Ju1-80				•	400	515700	EHRLICH 1982
	•	10-0ct-83	60,000	0					MRC
		MAP	10,000	(20)			100		-
	' W 15	25-May-77					37	6100229	MDH
		26-May-77		,		28		404579	BARR
		23-Jul-80	111.2	5		6.6			MDH
	•	28-Jul-80	1,337	184		14			MDH
	1	MAP	(1,000)	(100)			(20)		



N.

Well	Sample	PAN in parts	per trillion	FILETIOTEC	s in parts per bi	Method		
Numbe r	Collection	Non-Carcinogenic	Carcinogenic (b)	GC/MS	MBTH/4 AAP	Unknown	Document Number	Data Sourc
W16	19-Apr-77				2		404579	BARR
	25-May-77					0	6100229	MDH
	26-May-77				4		404579	BARR
	01-Mar-79	100	0			0	WSP2211	HULT 1981
	05-Apr-79	210	0		0		9402625	MDH
	23-Ju1-80	13.6	0		2.7		9611327	MDH
	23-Dec-83	0	0					MRC
	MAP	100	0			(4)		
7 17	19-Apr-77				280		404579	BARR
	25 -May- 77					340	6100230	MDH
	26 -May -77				140		404579	BARR
	31-May-77	1,700,000 ^(c)	0					USEPA
	02-Jun-77				1 80		404579	BARR
	22-Jun-77				32		404579	BARR
	01 -Mar- 79	5,000	0			200	WSP2211	HULT 1981
	03-Apr-79	14,510	0		240		9402618	MDH
	02-Jun-80	3,733	0	0	300	•	9611345	MDH
	16-Jan-84			180	300		9628658	MPCA
	MAP	100,000	0			250		
₹25	25 -Hay- 77				35		6100228	MDH
	MAP	-	-			(35)		
159	15-Feb-80	47,000	12,600		31		9201273	MDH
	МАР	(47,000)	(13,000)			(31)		
165(e)	08-Feb-79	28,192	331.7		3.8		7200360	мрн
	09-Feb-79	2,725.2	422.8					MDH
	01-Ju1-83	500	0			0		MRC
	10-Oct-83	400	0				•	- MRC
	MAP	3,000	(350)			(2)		



•				Phenolics in parts per billion							
Well	Sample	PAH in part	per trillion		Name 11 A 2 12	Method					
<u>Number</u>	Collection	Non-Carcinogenic	Carcinogenic (b)	GC/MS	MBTH/4 AAP	Unknown	Document Number	Data Source			
W116	17-Apr-79	11,900	0		2.6		4402658	МДН			
	23-May-80	803	313		5		9611407	MDH			
,	01-Feb-81	0	0	0			800013	MRI			
	06-Sep-83				20		9611021	MPCĀ			
	MAP	(1,000)	(80)			(5)					
W117	01-Jan-79	4,900	0				6641413	USGS			
	10-Apr-79	908,170	110		26		9402639	MDH			
-	17-Apr-79	61,800	0		20		4402658	MDH			
	23-May-80	760	0		15		9611409	MDH			
	01-Ju1-80	0	0			10	515700	EHRLICH 1982			
	16-Jul-80	3.4	10					MDH			
	11-Mar-81	13,410	48.1		11		6640329	MDH			
	11-Feb-81	. 3,000	0	0			800000	MRI			
	06-Sep-83				30		9611021	MPCA			
1	01-Oct-83	30,000	0					MRC			
1	10-0c t-83	40,000	0					MRC			
ŧ	02-Dec-83			9.8	41		9628655	MPCA			
1	MAP	40,000	(10)			30					
W128	25-May-77				56,000		6100229	МОН			
{ .	HAP	-	44		1	(56,000)					
; W1 34	01-Dec-83			28	30		9628654	MPCA			
ıl	MAP	-	-			30					
' W135	25-Jun-80	5.3	0	0	4.8		9611444	МДН			
b	MAP	(5)	(0)			(5)					
W136	07-Dec-83			21	11		9628656	MPCA			
e	HAP	-	-			15					

-			
	,		
_			
		1	

- a. All results reported as below detection limits are counted as zero. The detection limits varied considerably for PAH (tenths of a part per trillion to tenths of parts per million), but were generally 2 parts per billion for most phenolics analyses (MDH lab MBTH method).
- b. Carcinogenic PAH include benz(a)anthracene, benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, dibenzo(a,e)pyrene, dibenzo (a,h)pyrene, dibenzo(a,i)pyrene, 7,12-dimethylbenz(a)anthracene, indeno(1,2,3-cd)pyrene, and 3-methyl-cholanthrene.
- c. Individual PAH were not identified, only a total PAH reported with no indication of carcinogenic fraction.
- d. Sample was collected from the water table at a depth of four feet. there was no indication on the data sheet that the sample came from a well.
- e. W65 is a Platteville-St. Peter well according to Hult, 1981. However in 1983 this well was only 57 feet deep, so it is assumed to now draw water from holes in the casing adjacent to the drift.

TABLE 5 RESULTS OF PAH AND PHENOLICS ANALYSES FOR PLATTEVILLE WELLS (4)

É	SAMPLE	PAH RESULTS (PPT)		PHENOLICS RESULTS (PPB)				
WELL NUMBER	COLLECTION DATE	NON-CARCINOGENIC	CARCINOGENIC (6)	GC/NS	MBTH/4AAP	METHOD Unknown	DOCUMENT NUMBER	DATA SOURCE
. 2103	01-Jul-80 PAM	5.00 (5)	4.30 (4)	0.00	0.00 (0)		9611313	нон
P118	03-Jun-80 MAP	2,445.00 (2400)	0.00 (0)	0.00	92.00 (92)		9611412	HDH
₹121	12-Jun-80 Map	·			18.00 (18)			MDH
2900 CAVELLE (c) 2900 CAVELLE	15-Jan-80 Jul-83 MAP	1,526.70 100.00 (1500)	187.50 0.00 (190)		0.00 (0)	0.00	9200675	MDH MRC
RR SWITCH HOUSE	07-Jul-81 MAP	16.60 (17)	3.70 (4)		0.00 (d)			MBH
SLP#1	18-Sep-73					35.00	1000163	МОН
₩ SLP#1	25-Sep-73					0.00	50000353	MDH
SLP#1	04-Dec-73					13.00	6600130	MDH
SLP#1	03-Jan-74					0.00	1000149	MDH
SLP#1	08-Jan-74					3.00	1000145	HOH
SLP#1	16-Jan-74 22-Jan-74					0.00 9.00	1000143 1000137	MDH MDH
SLP#1	22-Jan-74 30-Jan-74					0.00	1000137	MDH
SLP#1	50-4411-74 05-Feb-74					7.00	6400095	MDH
SLP#1	25-Aug-75					0.00	544069	MOH
COLFEI	MAP				(10)	V.VV	317007	יוטוי
SLP#3 (W113) (c)	18 - Sep-73					0.00	1000163	MOH
SLP43 (W113)	04-Dec-73					2.00	5600130	HOH
SLP43 (W113)	03-Jan-74					5.00	1000149	HDH
SLP#3 (W113)	08-Jan-74					6.00	1000145	MDH
· SLP#3 (W113)	16-Jan-74					0.00	1000143	MDH
SLP#3 (W113)	22-Jan-74					4.00	1000137	MDH
_ SLP#3 (W113)	30-Jan-74					0.00	1000135	MDH
SLP#3 (W113)	05-Feb-74					0.00	6400095	HDH
SLP#3 (W113)	17-Jul-74					0.00	6600075	HDH
SLP#3 (W113)	25-Aug-75					16.00	544069	MDH
SLP#3 (W113)	19-Oct-77	=.	wa			0.00	6002166	MDH
SLP43 (W113)	29-Jan-80	36.00	30.00				6610310	MDH
SLP43 (W113)	21-May-80	20.00	0.00				6640144	MDH
SLP43 (#113)	03-Jul-80	0.94	0.00				((4)7)7	40H
- SLP43 (W113)	28-Jan-81	0.00	0.00				6646363	MŪN MEG
SLP#3 (W113)	19-Jan-83 MAP -	0.00 (10)	0.00 . (6).			(3)	9611786	40H

RESULTS OF PAH AND PHENOLICS ANALYSES FOR PLATTEVILL NELLS

DUCMU!	rcc	DECIN TO	: /DDD\
PHENOL	เเอ	RESULTS	3 (PPB)

	SAMPLE	DAIL BERLEY	5 /DDTL	11144				
(ELL • NUMBER	SAMPLE COLLECTION DATE	PAH RESULTSNON-CARCINOGENIC	CARCINOGENIC	GC/NS	MBTH/4AAP	METHOD UNKNOWN	DOCUMENT NUMBER	DATA SOURCE
wonder			CHUCTHOCKIC				**************************************	
_ W1	12-Apr-76				0.00		404579	BARR
W1	26-May-77				0.00		404579	BARR
M1	26-May-77				0.00		404579	BARR (MDH)
' W1	29-Mar-79	70.00	0.00		0.00		9402559	MDH
~ W1	01-Jul-80	13.50	5.80	0.00	0.00		9611313	HDH
W1	06-Feb-81	450.00	0.00	0.00			800000	MRI
	MAP	(100)	(6)		(0)		•	
W18	29-Mar-79	47,620.00	0.00		73.00		9402553	MDH
W18	10-Jun-80 (2 3				100.00			MDH
W18	10-Jun-80 (45		0.00	0				HOH
` W18	10-Jun-80 😘	SEC) 536.00	0.00	0.00	110.00		9611348	MDH
W18	18-Jan-84			74.00	150.00		9629558	MDH
•	MAP	(5000)	(0)		(100)		1	
W19	Mar-79	12.50	6.00			10.00	WSP2211	HULT 1981
W19	21-Mar-79	9.90	5.30		10.00		9402757	HDH
W19	23-Jul-80	1.40	0.00		0.00		9611350	HOH
	MAP	10	6		10			
″ ₩20	Mar-79	36.80	4.00			40.00	WSP2211	HULT 1981
~ W20	21-Mar-79	36.00	4.18		34.00		9402757	HDH
W20	26-Jul-80				36.00		9611352	MDH
·	MAP	36	4		26			
W22	29-Mar-79	890.00	0.00		0.00		9402553	МОН
W22	25-Jul~80	75.50	10.10		0.00		9611284	ндн
_	MAP	(900)	(10)		(0)			
W26	17-Apr-79	12,220.00	40.00		2.20		9402664	HDH /
W26	26-Ju1-80				22.00		9611356	MDH
~	MAP	(12000)	(40)		(22)			
W27	17-Ju1-79	7,995.00	0.00		52.00		9402761	нон
W27	25-Jul -80	2,362.00	20.00		180.00		961:1358	MDH
W27	Jul-83	6,000,000. 0 0	0.00		26,000.00			MRC
#27	10-Oct-83	1,230,000.00	0.00					HRC
	MAP	1000000	0		2600			
N30(C)	03-Jan-70					0.00	9611078	MDH
W30	03-Jan-74					0.00	640080	MDH
~ R30	08-Jan-74					4.00	9611878	49H
M30	16-Jan-74					0.00	50000342	NDH
M20	05-Feb-74			٠		2.00	9611878	MDH

RESULTS OF PAH AND PHENOLICS ANALYSES FOR PLATTEVILL WELLS

PHENOL	TOO	RESUL1	76	1000
PMPMIII	11 4	ME-AIII I	•	IPPRI

•	SAMPLE	PAH RESI	FRENUL	.163 KE3061	3 (FFB)			
IELL	COLLECTION	***************************************		CC /HC	MDTU/AAAD	CONT3#	ROCHMENT NUMBER	BATA COURCE
HUMBER	DATE	NON-CARCINOGEN	IC CARCINOGENIC	6C/MS	MBTH/4AAP	UNKNOHN	DOCUMENT NUMBER	DATA SOURCE
	•							
M30	26-Apr-79	70.	00 1.30			0.00	9200714	MDH
W30	14-May-79	189.				5.80	9200726	MDH
N20	26-Apr - 80	70.				5.80	9611881	MDH
	MAP	(10	0) (8)			(4)		
(c)	10 0 77				1 1100 00		9611886	MDH
422	18-Dec~73				1,000.00		9611886	MDH
133 133	27-Dec~73				1,200.00 1,200.00		9611886	MDH
,_ H33	03-Jan-74				1,000.00		9611886	MDH
N32	08-Jan-74 16-Jan-74				1,100.00		7611886	MOH
M22	22-Jan-74				1,200.00		9611886	MDH
#32 #33	22-Jan-74 30-Jan-74				1,100.00		9611886	MOH
H33	05-Feb-74				1,100.00		9611886	MDH
N33	22-May-74				620.00		9611886	MDH
~ M32	11-Nov-74				1,100.00		9611886	HDH
N22	01-Apr-76				170.00		404579	BARR
133	26-May-77				140.00		404579	BARR
433	26-May-77				390.00		404579	BARR
M23	10-Ju1-78				217100	22.00	7366666	MDH
M22	05-Jun-79	4.	10 9.10		220.00		9200709	MDH
	MAP		4) (9)		(1400)			
·		·						
- W 37	Jan-79	902.	50 0.00		10.00		WSP2211	HULT :95:
₁ W37	08-Feb-79	862.			11.00		7200360	HDH
	HAP	9	00 0		10			
~ _{₩38} (c)								
	09-Jan-80	(d) 42,460.	•			11.60	9200730	474
W38	07-Apr-80	(1110)(d) 42,460. 6,040.			2.80		9201261	4[]+
W38	07-Apr-80	(1505) 28,600.			2.20		9201261	HDH -
_ M38	07-Apr-80	(1237) 116,100.					9201260	MDH
	MAP	(10000	0) (10000)		(10)			
- M60 (C)	47 1 - 30	70	FA 50 34				0000770	48. 1
- MPO	13-Jun-79	20.				4.80	9200730	MDH
_	MAP	(2	1) (29)			(5)		
رد) 475	25 May 70	04	00 7.40			۸ ۸۸	0200705/7200245	48 1
W/3	22-May-79	80.				0.00	9200705/7200245	HDH
	MAP	(8	1) (2)			(0)		
- W100	Jan-79	61.	80 1.00			0.00	WSP2211	HUC* 1781
W100	21-Mar-79	65.				0.00	9402754	MDH
W100	29-Har-79	501			0.00	****	9402585	HUH
W100	30-Jun-80	6.	70 0.00		7.00		9611316	нрн
W100	15-Jul -80		00 3.90				9611382	w[jri
H100	08-Dec-80	6,050.					9611588	MEH
WEQO	09-Sep-82	- · · · · · · · · · · · · · · · · · · ·	00 0.00		•	-	534013	CHIM HILL .
		٠.	7100					

RESULTS OF PAH AND PHENOLICS ANALYSES FOR PLATTEVILL WELLS

		PAH RESULTS (PPT) NON-CARCINOGENIC CARCINOGENIC		PHENOL	ICS RESULTS	G (PPB)		
ELL NUMBER	SAMPLE Collection Date			GC/MS	MBTH/4AAP	HETHOD Unknown	DOCUMENT NUMBER	DATA SOURCE
·/			**********					
1100	08-Nov-82 Map	19.20 60	2.50 (4)		(7)		534013	CH2M HILL
101	Jan-79	1,041.00	1.00			20.00	WSP2211	HULT 1981
W101	21-Mar-79	848.30	0.90		14.00		9402504	MDH
4101	17-Apr-79				14.00		9402667	MDH
101	23-May-80	986.00	200.00		27.00		9611386	MDH
101	16-Ju1-80	1,801.00	0.00					MOH
_ W101	06-Feb-81	5,540.00	0.00	0.00			800000	MR 1
1101	Jul -83	80,000.00	0.00		6,000.00			MRC
1101	06-Sep-83				26.00		9611021 ·	MPCA
W101	10-Oct-83	20,000.00	0.00					MRC
	MAP	10000	0		26			
~d115	Jan-79	161.00	0.00			10.00	WSP2211	HULT 1981
4115	21-Mar-79	138.00	0.00			9.00	9402754	MDH
4115	17-Apr <i>-</i> 79				9.00		9402667	MDH
Wiis	23-Jul -80	111.20	5.00		6.60		9611328	HOH
	NAP	(150)	(5)		10			
#120	29-May-80	119.00	0.00		41.00		9611300,9611298	MDH
	MAP	(120)	(0)		(41)		·	
W121	26-Jun-80	1.10	0.00		3.20			Мір
	HAP	(1)	(0)		(2)			
W125	23-May-80	8,795.00	0.00		14.00		9611425	MG-P
W123	07-Sep-83				32.00		9611020	MPĮw
	MAP	(0088)	(0)		20			
W124	22-May-80	21,030.00	813.00		5.00		9611429	MDH
H124	16-Jul-80	4,69	0.00					MDH
H124	06-Feb-81	0.00	0.00	0.00			800000	MF:
H124	06-Feb-81	485.00	51.00				800000	MRj
W124	06-Sep-83				0.00		9611022	MPCA
W124	10-Oct-83	0.00	0.00					MRC
	MAP	500	. 51		(2)			
¥126	24-Jun-80	9.60	1.60	0.00	5.80		9611433	MDH
W126	10-Oct-83	300.00	0.00				•	MRC
	MAP	200	0		(9)			
- W127	23-Jun-80	0.00	v.00	0.00	13.00		9611435	MDH
	MAP	. (0)	(0)		(10)			

(2) **(Z)** 200 **9AM** M142 JAH 00.0 200'00 10-0°F-82 HOW 441196 5.60 7.00 28'10 32-2n1-80 R142 (2) (140) (0011) **AAM** 4,411.00 HOM 2.70 188.00 12-14n-80 A121 (9) (0) (\$L) PAH HON 691196 74.00 08-unt-72 AI 25 12.00 00.0 00.0 (20) **AAM** HOM 7828657 27.00 28.00 12-Dec-82 H121 PAH (2) (0) (06) HOH 08-IPC-10 M120 2121196 2.60 00.0 00.0 09.98 SOURCE STAD DOCUMENT NUMBER NAKHONN SH/39 CARCINDSENIC NON-CUBCINORENIC **3TA0** MUMBER **9AAP\HT8M** COLLECTION 773# METHOD (T99) STJU238 HA9 SAMPLE PHENOLICS RESULTS (PPB)

RESULTS OF PAH AND PHENOLICS ANALYSES FOR

- a. All results reported as below detection limits are counted as zero. The detection limits varied considerably for PAH (tenths of a part per trillion to tenths of parts per million), but were generally 2 parts per billion for most phenolics analyses (MDH lab MBTH method).
- b. Carcinogenic PAH include benz(a)anthracene, benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, dibenzo(a,e)pyrene, dibenzo (a,h)pyrene, dibenzo(a,i)pyrene, 7,12-dimethylbenz(a)anthracene, indeno(1,2,3-cd)pyrene, and 3-methylcholanthrene.
- c. These wells are multi-aquifer wells that probably yielded some unknown fraction of their total discharge from the Platteville aquifer.
- d. Evidently, time series sampling was done, however the starting time for pumping is not indicated on the data sheets.

1

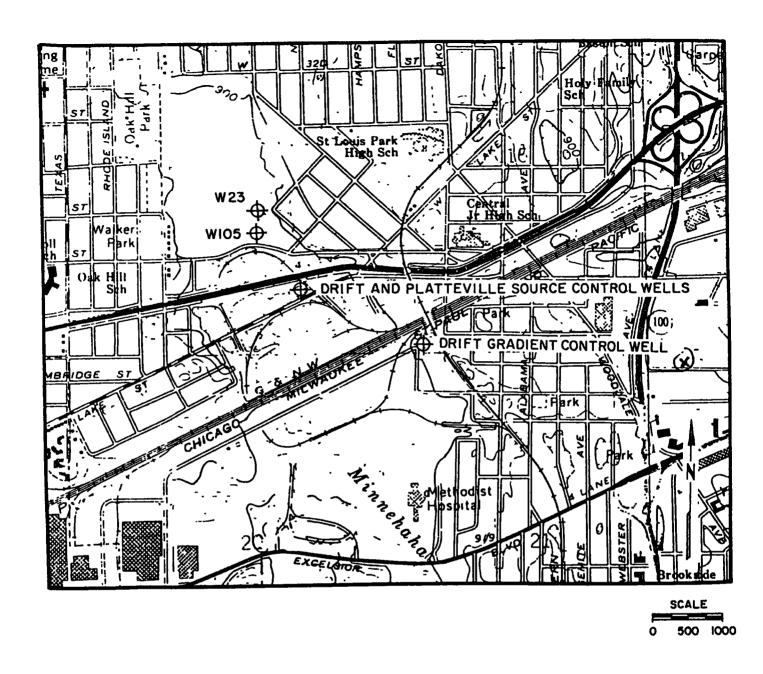


Figure 15 Location of Source and Gradient Control Wells

Multi-aquifer Wells

Wells that are hydraulically connected (e.g., via screens, open bore holes, un-grouted casings, or through holes in casings) to more than one aquifer have been determined to play a significant role in the migration of contaminants into the Prairie du Chien-Jordan Aquifer in St. Louis Park. Previous studies have not been able to demonstrate a significant role of multi-aquifer wells in allowing contaminants to migrate into the St. Peter Aquifer due to a lack of data. The U.S. Geological Survey (USGS, Water Supply Paper 2211, 1984) investigated a number of suspect wells and "No flow was detected" entering the St. Peter Aquifer, despite downward hydraulic pressures. In summary, the USGS suggested that "More observation wells will be needed to clearly evaluate whether or not Platteville-St. Peter multiaquifer wells have had a measurable effect on the quality of water in the St. Peter aquifer". Of the many multi-aquifer wells that have been identified in previous studies (Tables 6 and 7) many have been sealed or reconstructed, including known multi-aquifer wells connecting the St. Peter Aquifer with overlyng contaminated portions of the Drift-Platteville Aquifer (Figure 8), except well W23.

Well W23 will be reconstructed as part of the RAP implementation. The possible significance of well W23 in the distribution of contaminants in the St. Peter Aquifer is addressed in this Plan and will be evaluated during the present investigation.

Since well SLP3 is constructed across both the Platteville and St. Peter Formations, an assessment of the potential for contaminated water to be drawn into SLP3 will be done during the St. Peter and Northern Area RI/FS studies. This assessment will include recommended remedial measures, if needed.

History of Response Actions

A summary of previous response actions conducted by local, state, federal, and private parties, including site inspections and other technical reports and their results is included in Appendix A. Enforcement activities taken to identify responsible parties, compel private cleanup, and recover costs are summarized. A list of reference documents that currently exist in the public domain is included. The scope of this investigation addresses the problems and questions that have resulted from previous work at the site.

Boundary Conditions and Site Map

The objective of the RI is to determine the nature and extent of contamination in the St. Peter Aquifer. The area of investigation will be defined by the Remedial Investigation. Figures 1 and 5 depict the areas in which the contamination has been detected.

TABLE 6
MULTI-AQUIFER WELLS IDENTIFIED BY USGS, MDH AND MPCA

Aquifers Open to Well(s)									
Well Number	Well Name	Drift- Platteville	St. Peter	Prairie du Chien-Jordan	Ironton- Galesville	Mt. Simon- Hinckley	Status (b)	Source (c)	Remark s
									
Deep Wells									
W29	Flame Industries	хî	X?	X ?			P	H,M,U	1976 in minor use
W3 2	Texatonka Shopping Ctr.			x			L	H,U	
W34	Crib Diaper Service			8			SM,G	H,U	
W3 5	Burdick Grain Co.	X?	x?	x			MW; P	M,H,U,MPCA	
W38	Milwaukee RR Well	5	8	S	x	8	MW	H,U,UE	
W40	Minnesota Rubber			x			P	H,H,U	1976 in active use
W4 5	S&K Products, Inc.		x	x			P	H, M, U	
W4 6	S&K Products, Inc.		x	x			P	H,H,U	1976 in minor use
W4 7	Belco; Burdick Grain	S		8			S;G	v, H	
W4 9	Strom Block Co.		x	x			-	H,M,U	
W50	Prestolite		8	S	8		SM;G	U	
W6 2	McGourtney Plastics		x	x			P	ט,א,א	
W66	Black Top Service	x?	x?	X?			RF	H, U	deep well
W6 9	Hedberg-Friedheim	S	8	S			SM;G	H,U	Wolfe Lake
W70	Park Theatre			x			P	н, и	
W7 4	Landers Gravel	X?	X?	X			RS	s,u	
W105	Hinn. Sugar Beet	, x ;	*5	X S	١	X** (-	H, U	under study by Hickok. 1983
W107	Interior Elev.	X?	x	x .	x		-	H,U	
W1 12	Old SLP #1			x			MW;G	н, и	Old St. Louis Park Well SLP #1
W114	Hedberg-Friedheim	S	S				SM	υ	

TABLE 6 (Continued)

Aquifers Open to Well(a)									
Well	Well	Drift- Platteville	St. Peter	Prairie du Chien-Jordan	Ironton~ Galeaville	Mt. Simon- Hinckley	Status (b)	Source (c)	Remarks
Number	Name	PIACCEVILLE	St. Peter	CHIER-JOI GAR	GRIEBALLIE	HIREKTEY	Status	Source	KEMBIKA
Shallow Wel	<u>l•</u>								
W27	Terry Excavating	x	S				MW;G	н, υ	ll Oct 79 St. Peter sealed
W30	3636 Quebec	s	S				SM	н, U	
W33	Strand Mfg.	S	x				P; MW; G	H,U	ll Oct 79 Platteville sealed
W37	Dayton Rogers #2	x	x				MW;G	អ,ប	
· W41	Hartman #1	x	x				0	M	
W44	Kings Inn	. x	x				P	ម,ប	
W52	Merit Gauge	S	S				SM; G	H,U -	
W60	3645 Rhode Island	S	S				SM	H,U	
W61	W.V. Terry						-	н, U	No Data
W65	Ace Mfg.	x	x				L	H,U	
W67	Black Top Service	x?	x				-	R,U	Shallow Well
W75	Park Pet Hospital	x	x				P	H,U	
W 76	Professional Instru.	x?	x				P	H, U	
W106	Hedberg-Friedheim	X?	x				-	н, U	
W113	SLP #3	X	x				P	H,U	St. Louis Park Well SLP #3

⁽a)Aquifer Legend

X, aquifer presently open to well; X?, aquifer probably open to well; S, aquifer no longer open to well. (b) Status Legend

D, destroyed; O, obstructed; L, located; P, located with pump; S, sealed; RS, reportedly sealed; SM, sealed by MDH; MW, reconstructed as monitoring well; RF, reportedly filled; G, geophysically logged.

⁽c) Source Legend H, Hult (1979); U, Hult and Schoenberg (1981); M, Minnesota Department of Health (1979-1981); UE, USGS-ERT meeting of April 1980; MPCA, Minnesota Pollution Control Agency (1982).

TABLE 7 OTHER POSSIBLE MULTI-AQUIFER WELLS

Aquifers Open to Well									
Well Number	Well Name	Drift- Platteville	St. Peter	Prairie du Chien-Jordan	Ironton- Galesville	Mt. Simon- Hinckley	Status (a)	Source (b)	Remarks
W39	3612 Alabama		x				D	υ	
. W48	Methodist Hospital		x	x			P; G	ט	also screened in St. Lawrence Form. 285' deep
W63	National Foods			x			P	ប	
W72	Harder Res.		x				-	ប	
W73	Jasperson Dairy	x	x				-	U	
W80	Red Owl			x	•		-	υ	
W8 2	Weldwood Nursing	x?	x?	x?			-	U	
W86	Prudential #1			x			-	U	also screened in St. Lawrence Form.
W104	Rice Sand & Gravel			X?			-	U	
W109	Max Renner's Shop	x?	x				_	υ	
W111	6030 Oxford		x				L; G	U	
W118	Golf Course			x			RS	υ	also screened in St. Lawrence Form.
W119	Golf Course			X			-	ט	also screened in St. Lawrence Form.

D, destroyed; O, obstructed; L, located; P, located with pump; S, sealed; RS, reportedly sealed;

SM, sealed by MDH; MW, reconstructed as monitoring well; TS, temporarily sealed; RF, reportedly filled; G, geophysically logged.
(b) Source Legend

H, Hult (1979); U, Hult and Schoenberg (1981); M, Minnesota Department of Health (1979-1981); UE, USGS-ERT meeting of April 1980.

TASK 2 PLANS AND MANAGEMENT

This section describes the location and design of the five St. Peter Aquifer monitoring wells to be installed for this investigation. A detailed Sampling Plan is described in a separate document that describes all ground-water monitoring to be done in accordance with the RAP. Section B of this document describes relevant data management plans for the project. Section C contains the Health & Safety Plan, and Section D is the Community Relations Plan for this project.

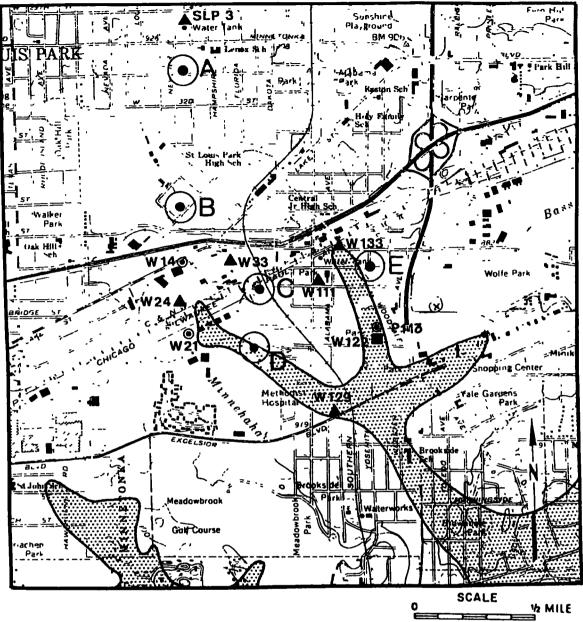
Well Locations

Figure 16 shows the proposed locations for the five new monitoring wells and the locations of existing St. Peter Aquifer wells (SLP3, W14, W24, W33, W122, W129, W133, and P116) that will be monitored during this investigation. Since 1979, samples from the existing St. Peter Aquifer wells have been subjected to a limited number of PAH analyses (Table 2). The historical data generally show elevated PAH concentrations at W14, W24, W122, and W133. Relatively low PAH concentrations at the other wells, including W33, indicate that there may be separate eastern and western areas of contamination in the St. Peter Aquifer, rather than one continuous contaminant plume. The possible existence of separate areas of contamination in the St. Peter Aquifer will be evaluated in this Remedial Investigation.

The five new monitoring well locations were chosen to enhance the existing monitoring well network, with particular emphasis placed on potential contaminant sources to the St. Peter Aquifer at well W23 and at the bog area south of the Reilly site. In the bog area, the Drift-Platteville Aquifer is known to be contaminated, and potential contaminant migration pathways to the St. Peter Aquifer exist (or existed) in the form of a bedrock valley and multi-aquifer wells. Also, wells W24 and W14 have shown elevated PAH concentrations in the past. Well W23 is considered a potential source of contamination to the St. Peter Aquifer because of its history of contamination in the Prairie du Chien-Jordan Aquifer. Monitoring wells B and C are positioned to investigate these two potential source areas, while the remaining three wells are located at greater distances from the source, to the north, south, and east (crossgradient and downgradient from the potential sources).

Based on the locations of possible sources of contamination to the St. Peter Aquifer, the historical water quality data, the ground-water flow pattern, and on the current distribution of monitoring wells in the St. Peter Aquifer, the following rationale is given for the locations of the five new monitoring wells:

M-57, Plate 1 of 2, Bedrock Geology, by Bruce A. Bloomgren, 1985



EXPLANATION

- **AW33** LOCATION AND PROJECT WELL NUMBER
 - **▲** OBSERVATION WELL COMPLETED IN ST. PETER AQUIFER
 - OBSERVATION WELL COMPLETED IN: BASAL ST. PETER CONFINING BED
 - NEW ST. PETER MONITORING WELLS
 - WELL IN WHICH WATER LEVELS WERE MONITORED WITH A DIGITAL RECORDER DURING PART OF 1978-81
- BEDROCK VALLEY/CONTACT WHERE UNCONSOLIDATED DRIFT DEPOSITS OVERLIE ST. PETER SANDSTONE

Figure 16 Proposed and Existing Well Locations and Bedrock Valley

- Well A Located mid-way between the site area and municipal well SLP3 on the south side of West 31st Street between Idaho and Jersey Avenues on the east side of the alley. It is anticipated that this location will monitor the northern fringes of ground water flowing east from the site and could serve as an early warning for contaminants migrating from the site area toward SLP3.
- Well B Located at the Municipal parking lot on Gorham Street between 1st and 2nd Streets NW within 50 feet of 1st Street. This location will monitor ground water flowing downgradient from the site and from potential contaminant sources at multi-aquifer wells W23 and W27.
- Well C Located near Edgewood Avenue and Oxford Street. This location will monitor ground water flowing downgradient of the site bog area and possibly ground water flowing downgradient of the head of the western arm of the bedrock valley. Well W24 has indicated elevated PAH concentrations in the bog area in the past.
- Well D Located in the western arm of the bedrock valley. The location of this station is between Methodist Hospital and the Railroad spur line on the southerly continuation of Edgewood Avenue and the northeast side of the sanitary sewer lift station. This station will monitor any contaminants entering the St. Peter due to the bedrock valley and/or other factors.
- Well E Located downgradient from the intersection of the Drift-Platteville plume and the eastern arm of the bedrock valley. The location of this well is at the easterly extension of West 37th Street from Wooddale Avenue South within a 30 foot radius of the fire hydrant on the south side. This location will monitor ground water to the east of the site and the eastern arm of the bedrock valley.

The well designations A, B, C, D, and E will be changed to project numbers using the USGS numbering system upon concurrence of all Project Leaders. All wells will be located on City-controlled property, and St. Louis Park will make all necessary arrangements for access requirements.

Well Design and Installation

Mud rotary drilling techniques will be used to construct the monitoring wells. The sequence of well construction activities will be:

Well Construction - Sites A, D, and E (Figure 17)

- 8 inch pipe shall be extended through the Drift Aquifer into the top of the Platteville Limestone, a distance of approximately 80 feet. The casing shall be provided with an acceptable drive shoe if necessary.
- o The Contractor shall continue drilling an 8-inch open bore hole through the Platteville Limestone into the upper 2 feet of the Glenwood Shale, a distance of approximately 30 feet.
- o 4-inch casing pipe shall be placed in the 8-inch cased/open bore well hole.
 - 1. The 4-inch steel casing shall extend 2 feet above the finished grade, and a security cap shall be provided.
 - 2. Appropriate steel guides shall be welded to the casing to center it in the 8-inch casing and open bore hole.
- o The entire annular space between the 4-inch casing and 8-inch casing and bore hole shall be filled with neat cement grout. All grout shall be placed from the bottom of the open bore hole through pressure injection via tremie pipe and shall be introduced in one continuous operation.
- o The grouted installation shall remain undisturbed for 48 hours before proceeding with the balance of the work.
- o Upon completion of the grouting operation, the Contractor shall drill a nominal 4inch diameter open bore hole a distance of at least 25 feet into the St. Peter Aquifer.
- The 20 foot screen/7 foot extension, with bottom plate, shall be lowered through the 4-inch casing into the 4-inch open bore hole. A suitable lead packer shall be wedged into place between the extension and 4-inch casing, exposing the screen and 5 feet of blank extension to the St. Peter Aquifer.

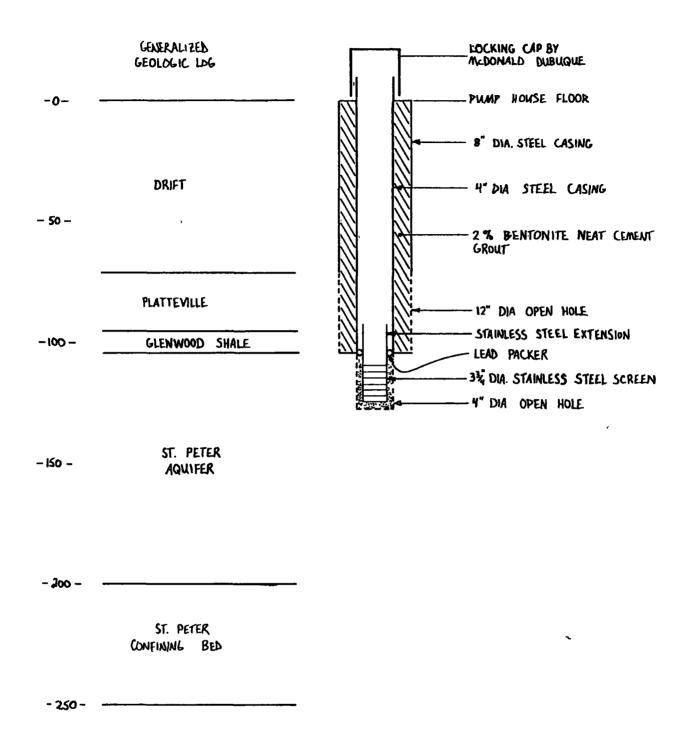


Figure 17.

ST. PETER AQUIFER MONITOR WELL DESIGN for MONITOR WELLS "A," "D" & "E"

The well shall be developed by the Contractor using surging, bailing, pumping and/or other appropriate standard development procedures to remove mud cake or other material which may block the screen, and/or affect water quality. At the conclusion of development, the well will be purged until the discharge pH and conductivity are stable and no remnants of the mud rotary operation are evident.

Well Construction - Site B (Figure 18)

- o 14-inch pipe shall be extended through the Drift Aquifer, into the top of the Platteville Limestone, a distance of approximately 80 feet. The casing shall be provided with an acceptable drive shoe if necessary.
- o The Contractor shall continue drilling a nominal 14-inch diameter open bore hole through the Platteville Limestone into the Glenwood Shale confining bed, a distance of approximately 30 feet.
- o 8-inch casing pipe shall be placed in the 14-inch cased/open bore hole into the Glenwood Shale, extending approximately 2 feet above the finished grade.

 Appropriate steel guides shall be welded to the casing to center it in the 14-inch casing and open bore hole.
 - 1. A security cap shall be provided.
- The entire annular space between the 8-inch casing and 14-inch case and bore hole shall be filled with neat cement grout. All grout shall be placed from the bottom of the hole through pressure injection via tremie pipe and shall be introduced in one continuous operation.
- The grouted installation shall remain undisturbed for 48 hours before proceeding with the balance of the work.
- O Upon completion of the grouting operation, the Contractor shall drill a nominal 8inch diameter open bore hole through the St. Peter Aquifer, to the top of the first shale strata in the Basal St. Peter confining bed, a distance of approximately 108 feet.
- o A 100 foot by 4-inch screen/casing combination (see Figure 18) shall be welded to 4-inch steel casing and the entire unit shall be lowered into the well.

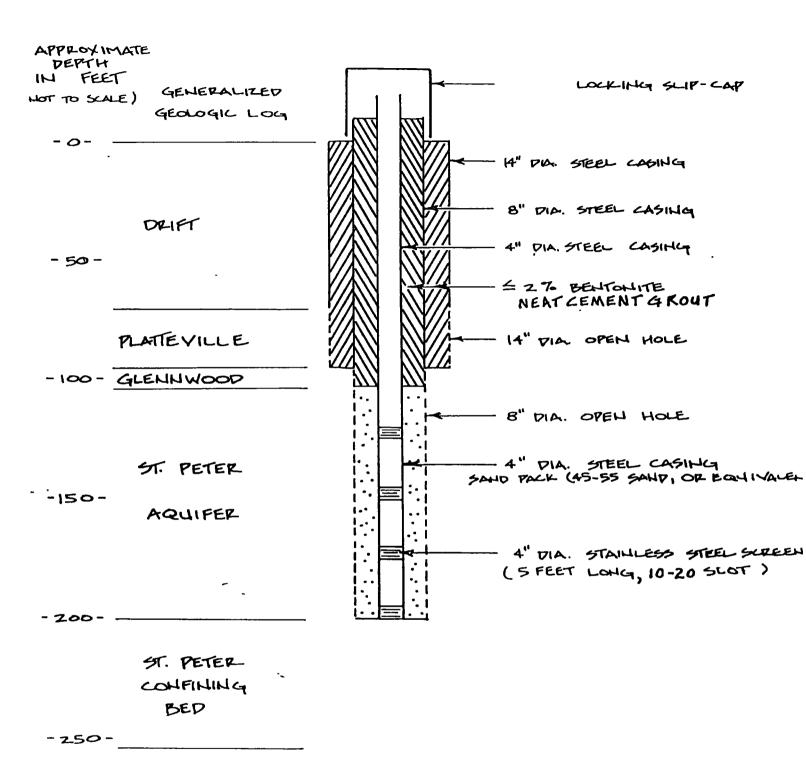


Figure 18.

ST. PETER AQUIFER MONITOR WELL DESIGN for MONITOR WELL "B" ONLY

- 1. The 4-inch steel casing shall extend 2 feet above the finished grade.
- Appropriate steel guides shall be welded to the casing to center it in the 8inch casing, and open bore hole.
- o A sand pack shall be placed in the annular space between the special design screen/casing section and open bore hole.
- The entire annular space between the 4 and 8-inch casings, above the sand pack shall be filled with neat cement grout.
- o The well shall be developed by the Contractor using surging, bailing, pumping and/or other appropriate standard development procedures to remove mud cake or other material which may block the screen and/or effect water quality. At the conclusion of development, the well will be purged until the discharge pH and conductivity are stable and no remnants of the mud rotary operation are evident.

Well Construction - Site C (Figure 19)

- o Drill and drive 18-inch diameter schedule 40 steel casing from ground surface to the top of the Platteville Formation (approximately 78 feet).
- o Drill nominal 18-inch diameter openhole through the Platteville Formation, approximately 2 feet into the Glenwood Shale confining bed (approximately 22 feet).
- o Install 12-inch diameter schedule 40 steel casing, grouted into place, leaving a one to two foot stick up above grade (approximately 102 feet of pipe).
- o Drill nominal 12-inch diameter open hole to the top of the Basal St. Peter confining bed (approximately 108 feet).
- o Install 6-inch diameter schedule 40 steel casing, from the top of the St. Peter Formation to one to two feet above the floor of the pump house, grouted into place.
- o Drill a nominal 6-inch (minus) open hole 20 feet into the St. Peter Formation.
- o Install 20 feet of stainless steel 10-slot screen in the open hole, secured to the 6-inch casing by means of a lead packer.

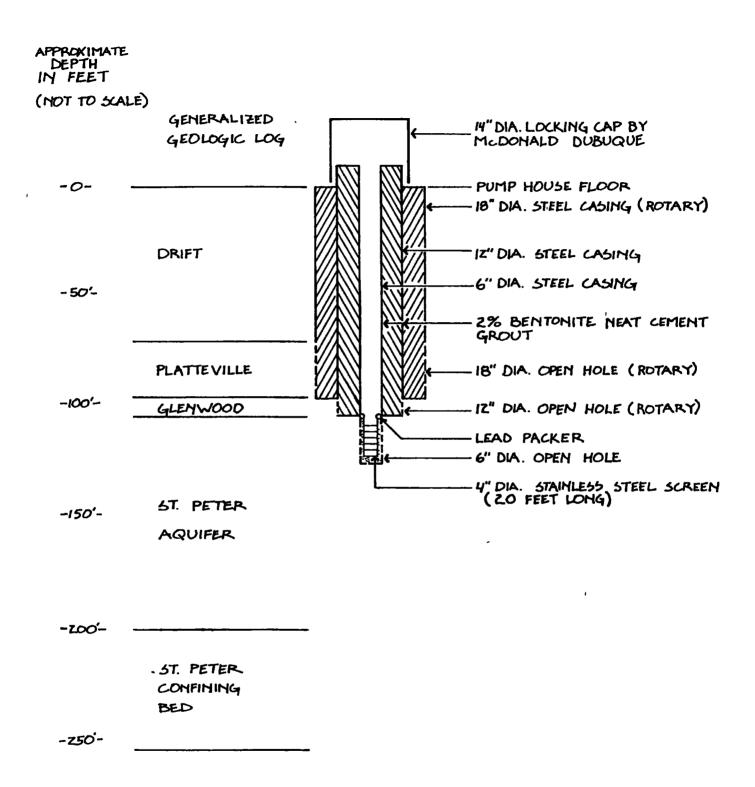


Figure 19.

ST. PETER AQUIFER MONITOR WELL DESIGN for MONITOR WELL C ONLY

The well shall be developed by the Contractor using surging, bailing, pumping and/or other appropriate standard development procedures to remove mud cake or other materials which may block the screen and/or affect water quality. At the conclusion of development, the well will be purged until the discharge pH and conductivity are stable and no remnants of the mud rotary operations are evident.

The licensed well contractor will perform the drilling and well construction procedures. All grout and other material specifications, including well protection, will conform with the requirements of the Minnesota Water Well Construction Code, Chapter 4725. Disinfectants will not be used, as they may interfere with subsequent water quality analyses. Samples of the sand pack, grout mix, and drilling mud will be retained for possible analysis if unusual or unexpected water quality results lead to concerns about sources of contamination from these materials.

The five drilling sites are in or adjacent to residential areas and will therefore be kept neat and clean at all times. Water produced from well development will be directed to the sanitary sewer in accordance with MWCC approval (Appendix B). Drilling fluids, cuttings, and other debris will be containerized and disposed of according to applicable regulations and in accordance with the Contingency Plan . (Appendix C). Drilling tools and equipment will be steam cleaned between wells. A record containing documentation of these procedures, field notes, well logs, measurements, etc. will be maintained.

TASK 3 SITE INVESTIGATION

The five monitoring wells will be installed within 120 days of receiving approval of this Plan and project specifications pursuant to Part G of the Consent Decree. The wells will be constructed and completed in accordance with this Plan. The well installation work is part of a hydrogeologic investigation to determine the nature and extent of ground-water contamination, and no waste characterizations or soils and sediment investigations are relevant.

Within 30 days of completing the new monitoring well installations, ground-water samples will be collected for PAH analyses. Before the samples are taken a survey will be conducted to determine the horizontal position of each well and the vertical elevation of the measuring points. Water levels will then be measured and ground-water quality samples will be taken at the new wells and at existing wells W14, W24, W33, W122, W129, W133, P116, and SLP3. These procedures will be done in accordance with the Sampling Plan, which is described in Section 3.2 of the RAP. Wells SLP3 and at least six other St. Peter Aquifer monitoring wells will be re-sampled for PAH monitoring within 6 months of the first sampling round, and again within 12 months of the first sampling round. The St. Peter Aquifer wells to be sampled during the second and third rounds will be determined based on a review of the results of the first sampling round.

TASK 4 SITE INVESTIGATION ANALYSIS

This task was previously performed during the CD-RAP negotiations and the results are reflected in that document. Therefore, no separate site investigation analysis will be performed for this project.

TASK 5 LABORATORY AND BENCH-SCALE STUDIES

This task may be required because additional studies may be necessary to fully evaluate remedial alternatives. Some remedial alternatives were evaluated during the CD-RAP negotiations, and the results are reflected in that document.

TASK 6 REPORTS

The requirements for status reports for all activities carried out in accordance with the CD-RAP are described in that document. No separate progress reports will be prepared for this project.

A final report summarizing the results of this investigation will be prepared in accordance with U.S. EPA "Guidance on Remedial Investigations Under CERCLA" (dated June 1985) in order to meet the requirement of the CD-RAP. However, in following said guidance, the City of St. Louis Park

relinquishes no rights granted it under the applicable Parts of the Consent Decree. The final RI report will be submitted within 90 days of completing the second round of ground-water sampling described in Task 3. The report will contain all boring logs, well completion details, analytical data, water level measurements, and other information obtained during this investigation. The purpose and objectives of the final report involve comparing the ground-water quality data from the St. Peter Aquifer monitoring wells to the criteria established in the CD-RAP to determine if contamination exists. A hydrogeologic evaluation will be made to determine if any present contamination is spreading. Recommendations on the need for a Feasibility Study will be made.

APPENDIX A HISTORY OF RESPONSE ACTIONS

The following background and history of response actions is an excerpt from the MPCA Board Item on April 22, 1986 "Request for Approval of a Consent Decree with the Reilly Tar & Chemical Corporation and Other Parties for the Purpose of Completing Remedial Investigations and Feasibility Studies and Developing and Implementing Response Actions at and Around the Reilly Tar Site in St. Louis Park". This material is in Section I of the Issue Statement of that MPCA Board Item.

Between 1917 and 1972, Reilly Tar & Chemical Corporation (Reilly) operated a coal tar distillation and wood preserving plant, known as the Republic Creosote Company, in St. Louis Park. This plant was located on an 80 acre tract near State Highway 7 and Louisiana Avenue (the Reilly Site; Figure 1). Reilly disposed of wastewater from the operation in a network of ditches which discharged into a swamp south of the Reilly Site. In addition, the wood treating activities conducted on the Reilly Site resulted in creosote and coal tar contamination of the soils from drippings and spills. The major constituents of coal tar are phenolic compounds and polynuclear aromatic hydrocarbons (PAH). Some PAH compounds are carcinogenic, and are thus a source of concern when a municipal drinking water supply is contaminated with these compounds. (As used in the remainder of this board item, "contaminated" or "contamination" means PAH or phenolics are present in soil or ground water resulting from activities of Reilly at the Reilly Site.)

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In 1932, the first municipal well in St. Louis Park (Old SLP #1) was constructed at Brunswick Avenue and West 36th Street, approximately one-half mile east of the Reilly Site. The well was finished in the Prairie du Chien-Jordan aquifer (Figure 2). After several weeks of operation, the well was closed due to taste and odor complaints (the taste was described as "swampy"). Laboratory tests showed that phenolic compounds were the apparent cause of the problem. Phenolics cause water to have an unpleasant taste and odor when the water is chlorinated, but these compounds are not believed to have adverse health effects at the low levels which cause the taste and odor problems.

Attempts to remedy the situation were unsuccessful, and the well was abandoned. Well drillers at the time speculated that the Reilly Site might be the source of the problem. Although Reilly, at the time, insisted that the problems at the municipal well were the result of "decaying vegetation" from the swamp south of the Reilly Site, it filled an unused well (W105) located on the Reilly Site with sand and extended the casings in Reilly's main water supply well (W23) to reduce interaquifer flow of possibly contaminated water.

Complaints from nearby residences over contamination of shallow wells and of odors from air emissions became more common, especially after extensive residential development of the area during the late 1940's into the 1950's. Because of continuing problems with soil and surface water contamination and odors 1/, the City of St. Louis Park (City) and the Minnesota Pollution Control Agency (MPCA) through the Attorney General (the State) filed suit against Reilly in 1970. In 1972, the City purchased the Reilly Site from Reilly, and

See paragraph thirteen, page 9, of the attached Consent Decree for a listing of various studies and/or reports, chemical analysis and field investigations relating to the Reilly Site.

the plant was dismantled and removed. The City intended to use the property for a realignment of Louisiana Avenue and for residential development, and dropped its lawsuit against Reilly as a condition of the sale. However, the State did not drop the lawsuit, which is still pending and will be dismissed as part of the proposed settlement.

In 1974, the City contracted with Gerald Sunde, a consulting engineer, to investigate pathways for the movement of contaminants. Sunde concluded that wells in the area open to several aquifers (multi-aquifer wells) provide a significant pathway for the spread of contamination from contaminated surficial aguifers to deeper aguifers which would otherwise be protected from contamination by several bedrock layers. In 1975, the MPCA contracted with Barr Engineering to investigate subsurface contamination at and south of the Reilly Site. The results of this study showed significant contamination of soil and the surficial aquifer (the drift) with creosote. Because it appeared that Sunde's assessment of the pathways for contamination to deep aguifers was, at least in part, correct, the Minnesota Department of Health (MDH) in 1978 and 1979 contracted for the closure of 29 multi-aquifer wells in areas where the surficial aquifers were the most contaminated. In addition, the City and the U.S. Geological Survey installed a packer and casing in the former Reilly well, W23, to stop the extensive downhole flow of contaminated water into the Prairie du Chien - Jordan Aquifer.

Louisiana Avenue was constructed through the Reilly Site during the mid-1970's, and some multi-family housing units were constructed in the northern half of the Reilly Site during this same time period.

In 1978 the MDH began analyses of water from municipal supply wells in St. Louis Park and neighboring communities for PAH using high performance liquid chromatography. These and subsequent analyses led to the discovery of significant concentrations of PAH in six St. Louis Park wells and one Hopkins well, and these wells were shut down during the period 1978-81.

As a result of the determination that area ground water was contaminated the State amended, in 1978, its complaint in the lawsuit with Reilly to include claims for ground water contamination. All of the municipal wells cited above are finished in the Prairie du Chien-Jordan aquifer, which is the most heavily used aquifer for municipal drinking water supplies in the Twin Cities metropolitan area. The City of St. Louis Park has since overcome part of the resulting water supply shortfall through water conservation measures, installation of a new well in the Mt. Simon-Hinckley aquifer, and an interconnection with the City of Plymouth. In an attempt to understand the processes of contaminant transport in the Prairie du Chien-Jordan, the MDH and MPCA contributed toward a ground water flow and contaminant transport modeling study performed by the United States Geological Survey (USGS). In addition, the MDH funded a study by Hickok and Associates of the feasiblity of ground water gradient control 2/ in 1981.

The MPCA received a \$400,000 grant from the U.S. Environmental Protection Agency (EPA) in December, 1981, and used this grant to finance a feasibility study conducted by the MPCA contractor, CH2M Hill, for replacement or treatment

The term "gradient control", as used in this discussion, refers to the utilization of a pumping well or wells, usually located near the leading edge of the contamination plume, to control the flow of ground water in an aquifer to contain contamination within the area of control. It is in contrast to "source control", in which highly contaminated water is pumped at or near the source.

of the lost water supply; and to locate, investigate, and close multi-aquifer wells. In December, 1982, the EPA awarded the MPCA a \$1.99 million grant under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to continue these studies, and to provide more funding for the USGS ground water modeling study for the purpose of designing a gradient control well system to control the movement of contaminants in the Prairie du Chien-Jordan aquifer.

The results of these studies have provided sufficient information to design a remedial approach for the contamination in the Prairie du Chien-Jordan aquifer. Multi-aquifer well investigation under the CERCLA grant has been limited to date, to two priority wells located on the Reilly Site. The most important of these, W23, was found to have a plug of coal tar in it, and has been cleaned out. The other well, W105, was the water supply well for the sugar beet plant which occupied the Reilly Site around the turn of the century, and was used by Reilly as a backup supply well until 1933. W105 was not found to be a source of contamination as was W23. The drinking water restoration study conducted by CH2M Hill, which analyzed the feasibility of various methods of treating drinking water, deeper wells, and an interconnection with Minneapolis, concluded that treatment with granular activated carbon (GAC) was the most cost-effective method of restoring the City's lost water supply. The USGS has completed its ground water flow modeling work, and this model has been used to examine gradient control schemes.

In September, 1980, the EPA filed suit against Reilly alleging violation of the Resource Conservation Recovery Act (RCRA). The State and St. Louis Park joined the lawsuit in October, 1980, followed by the City of Hopkins in June, 1981. After passage of CERCLA, the State filed an amended complaint in May, 1981, followed by St. Louis Park, the EPA, and Hopkins respectively in

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SECTION A SITE MANAGEMENT PLAN

August, September, and October, 1981. The State filed a second amended complaint under the Minnesota Environmental Response and Liability Act ("MERLA") in 1985 followed by St. Louis Park and Hopkins. In the event that agreement is not reached on the Consent Decree, the case is scheduled to be heard before U.S. District Court Judge Paul Magnuson.

In addition to the above litigation, Reilly filed a counterclaim against CSt. Louis Park, and St. Louis Park asserted a cross-claim against the State.

Other parties involved with the purchase and development of the northern portion of the Reilly Site filed cross-claims against St. Louis Park and Reilly. 3/

In May, 1983, Reilly and its consultant, Environmental Research & Technology, Inc. (ERT) issued a report on the St. Louis Park ground water contamination. Discussion among MPCA, EPA, Reilly and ERT staff led to a period of negotiations toward a settlement. These talks broke down in early 1984.

Both the MPCA and EPA have instituted administrative action against Reilly, pursuant to the respective State and federal Superfund acts, in order to compel Reilly to undertake necessary remedial actions. The EPA issued a Record of Decision (ROD) in June, 1984 affirming that the most cost-effective remedy for restoring the City's lost water supply was installation of a GAC treatment system. In August, 1984, the EPA issued to Reilly an Administrative Order directing Reilly to design and construct the GAC system for City wells SLP 10 and 15 as provided in the ROD. In December, 1984, the MPCA issued a Request for Response Action (RFRA) to Reilly outlining a range of remedial investigations, feasibility studies, and necessary remedial actions.

^{3/} The following organizations were included as defendants in the lawsuit because they were involved with the purchase and development of the northern portion of the Reilly Site from St. Louis Park: Housing and Redevelopment Authority of St. Louis Park, Oak Park Village Associates, and Philips Investment Co.

Following these administrative actions, extensive negotiations, which had previously broken down, resumed among the MPCA, EPA, St. Louis Park, and Reilly in an effort to reach an effective settlement. General agreement on the terms and conditions of a proposed Consent Decree was reached in the Summer of 1985. However, because of its complex nature and the large number of parties involved, final agreement was delayed. Since the likelihood of settlement was always present, the MPCA staff did not return to the MPCA Board for further administrative actions.

Since general agreement regarding a Consent Decree had been reached in mid 1985, Reilly did proceed to design and construct a GAC system for City wells SLP 10 and 15. Reilly completed the construction of the GAC system in December, 1985 and the system is expected to be operational by May, 1986.

The following background and history of response actions is Part C of the Consent Decree. A list of relevant reference documents is included.

1. From 1917 until 1972, Reilly was engaged in the business of coal tar distillation and pressure treatment of wood products at its plant site at 7200 Walker Street, St.

Louis Park, Hennepin County, Minnesota (hereinafter "the Site"). The Site encompassed an eighty (80) acre tract, which consists of Lot 1, Block 1; Lot 1, Block 2; Lot 1, Block 3; Lot 1, Block 4; Lot 1, Block 5; Lot 1, Block 6; Lot 1, Block 7; Lot 1, Block 8; Lot 1, Block 9; Lot 1, Block 10; all in Oak Park

Village according to the plat thereof on file in the office of the County Recorder of Hennepin County, Minnesota.

- 2. On or about October 2, 1970, the State, through its Pollution Control Agency, and St. Louis Park, filed a complaint in the Hennepin County District Court of the State of Minnesota alleging violations by Reilly of state and municipal pollution control laws and regulations. State of Minnesota by the Minnesota Pollution Control Agency, and the City of St. Louis Park v. Reilly Tar & Chemical Corporation, Hennepin County District Court, Civil File No. 670767 (hereinafter "Hennepin County Lawsuit").
- 3. On April 14, 1972, St. Louis Park agreed to purchase the Site from Reilly. The purchase agreement included a promise by St. Louis Park to obtain dismissals with prejudice by the State and by St. Louis Park of the Hennepin County Lawsuit. The purchase agreement also provided for acceptance by St. Louis Park of the property in an "as is" condition, including "any and all questions of soil and water impurities and soil conditions," and an agreement by St. Louis Park "to make no claim against Reilly for damages relative to soil and water impurities, if any, in any way relating to the premises sold herein, or relative to any other premises in which the City of St. Louis Park holds an interest. . . ."
- 4. A closing was scheduled on the property for June 19, 1973. However, the State did not execute a dismissal

of the Hennepin County Lawsuit. Accordingly, the City of St.
Louis Park agreed that it would "hold Reilly harmless from any and all claims which may be asserted against it by the State of Minnesota, acting by and through the Minnesota Pollution Control Agency, and will be fully responsible for restoring the property, at its expense, to any condition that may be required by the Minnesota Pollution Control Agency". The City of St.
Louis Park and Reilly executed and filed dismissals with prejudice of their claims in the Hennepin County Lawsuit, and the closing took place thereafter.

5. On June 21, 1973, the property was conveyed by quitclaim deed from St. Louis Park to the Housing and Redevelopment Authority of St. Louis Park, Minnesota, which thereafter conveyed part of the property to Oak Park Village Associates, Rustic Oaks Condominium, Inc. and Philip's Investment Co.

The Agreement for Purchase and Sale of Real Estate dated October 4, 1977 and the First Addendum to the Agreement dated October 6, 1977 between the St. Louis Park Housing and Redevelopment Authority and Diversified Equities Corporation [Oak Park Village Associates] regarding Lot 1, Block 3, Oak Park Village, Hennepin County, Minnesota, provides as follows:

14. Environmental Matters

The Agency [St. Louis Park Housing and Redevelopment Authority] shall prepare and shall incur all expenses for any environmental approvals, assessments, environmental impact

statements or such other environmental review documents deemed necessary or desirable by governmental authority.

Agency [St. Louis Park Housing and Redevelopment Authority] agrees to indemnify and save Redeveloper harmless from and against any and all loss or damage Redeveloper or successors may suffer from damage to improvements constructed on the Property as a result of claims, demands, costs or judgments against and arising out of soil or ground water contamination existing as of the date hereof, or caused by conditions existing as of the date hereof.

The Agreement for Purchase and Sale of Real Estate dated

June 1, 1979 by and between the Housing and Redevelopment

Authority of St. Louis Park and Ben Weber [Philip's Investment

Co.] and the City of St. Louis Park regarding Lot 1, Block 6,

Oak Park Village, Hennepin County, Minnesota, provides as

follows:

14. Environmental Matters.

Both the City and the Redeveloper agree that the Stipulation between the City and the PCA dated April 19, 1977, is capable of a possible variety of interpretations. As between the Agency [St. Louis Park Housing and Redevelopment Authority], the City and the Redeveloper, as an inducement to the City and Agency to allow the Redeveloper to develop the Property and as security against the Redeveloper, or its assigns or successors in interest, claiming the right to benefit from a broader interpretation of said Stipulation and as an inducement to the Redeveloper to develop the Property and as security against the City or Agency claiming the right to benefit from a narrower interpretation of said Stipulation, the City, Agency and Redeveloper agree that, as between the parties to this Agreement, this paragraph 14 shall constitute the sole remedy available to Redeveloper against the City and Agency for any action or claim against or loss or damage to the

Redeveloper which is based on, derived from, or related to the soil or groundwater conditions of the Property, and shall constitute, as between the parties to this agreement, their interpretation of the Stipulation.

- b. The City will not require the Redeveloper to excavate soil from the Property in question because of soil or groundwater contamination resulting from the operations of the former Republic Creosote Plant.
- c. The City will indemnify the Redeveloper from damage consisting of physical destruction or injury to improvements on the property due solely to soil excavation on the Property required by public agencies. This indemnification shall not include consequential damage, lost income, lost profit or other forms of indirect loss or damage nor shall it include damage arising from personal injury. Indemnification shall be on a replacement cost less depreciation basis.
- d. The indemnification granted by this agreement shall be secondary to any other rights or potential rights which the Redeveloper may have to compensation for any damage or loss whether through eminent domain, grants or otherwise. The Redeveloper shall exercise good faith effort to seek and obtain such compensation before presenting a claim under this indemnification agreement. Any compensation from any other source for damages indemnified herein shall reduce the indemnification liability of the City dollar per dollar.
- e. This indemnification and agreement shall not be assignable except to the first mortgagee and shall terminate on January 1, 1985. All claims to indemnification under this agreement must be made in writing and received by the City Clerk of the City prior to January 2, 1985.
- 6. In April, 1978, the State moved to amend its complaint in the Hennepin County Lawsuit, alleging that PAH substances contained in Reilly's coal tar and creosote wastes had entered the ground water beneath the Site and that their

further migration threatened to contaminate aquifers relied on for public water supply. At the same time, St. Louis Park moved to intervene as a plaintiff. The motions were granted and interlocutory review was denied by the Minnesota Supreme Court. Reilly subsequently tendered defense of the action to St. Louis Park and counterclaimed against St. Louis Park, asserting that St. Louis Park was responsible for dealing with this problem under the hold harmless agreement made at the time of its purchase of the Site.

- 7. On or about September 4, 1980, the United States commenced this action by filing a complaint under Section 7003 of the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. § 6973, alleging, inter alia, the existence of an imminent and substantial endangerment to health and the environment due to the handling, treatment, storage, transportation, disposal and presence of hazardous waste at the Site. On or about October 15, 1980, the State and St. Louis Park were granted leave to intervene in the RCRA Section 7003 claim and to assert additional claims under Minnesota law. On or about June 16, 1981, Hopkins was granted leave to intervene in the RCRA Section 7003 claim and to assert additional claims under Minnesota law.
- 8. On or about September 9, 1981, the United States filed an amended complaint, alleging in addition to the RCRA \$ 7003 claim, claims under Sections 106 and 107 of the

Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. §§ 9606 and 9607.

- 9. On or about May 27, 1981, the State filed an amended complaint, asserting claims under Section 7003 of RCRA, 42 U.S.C. § 6973, Section 107 of CERCLA, 42 U.S.C. § 9607, Minn. Stat §§ 115.061, 115.07, 115.071, and Minnesota Rule WPC 4(b) [Minn. Rule Part 7100.0020], and Minnesota common law.
- 10. On or about August 31, 1981, and October 16, 1981, respectively, St. Louis Park and Hopkins filed amended complaints alleging, inter alia, claims under Section 7003 of RCRA, 42 U.S.C. § 6973, Section 107 of CERCLA, 42 U.S.C. § 9607, Minn. Stat. Chapter 116B, and Minnesota common law.
- 11. On or about April 5, 1985, the Court granted the State's motion for leave to file a second amended complaint, adding claims under the Minnesota Environmental Response and Liability Act ("MERLA"), Minn. Stat. Ch. 115B. The State subsequently filed such a second amended complaint. Pursuant to stipulations, St. Louis Park and Hopkins later also filed second amended complaints, each of which added MERLA claims.
- 12. Reilly, in its answers to the various complaints referenced above, has denied and continues to deny liability, has raised several affirmative defenses, and has asserted a counterclaim against St. Louis Park. Various other Parties have asserted cross-claims, including a cross-claim by St. Louis Park against the State, a cross-claim of Oak Park Village

Associates against the Housing and Redevelopment Authority of St. Louis Park and a cross-claim of Philip's Investment Co. against Reilly.

13. Since 1969, a number of studies and/or reports, chemical analyses and field investigations relating to the Site have been undertaken. By listing the items below, the Parties do not necessarily endorse the accuracy, correctness, precision, quality, or validity of the information and opinions contained therein. These analyses, investigations and studies include but are not limited to the following:

(a) Studies and/or Reports

- (1) "Ground Water Investigation Program at St. Louis Park, MN," by E. A. Hickok & Associates, Inc., September, 1969.
- (2) "Memorandum of Waste Disposal at Republic Creosote Co. and Reilly Tar & Chemical Co.," by Minnesota Pollution Control Agency (MPCA Board Item), April, 22, 1970.
- (3) "An Assemblage of Analytical Data Regarding the Reilly Tar & Chemical Property, St. Louis Park, Minnesota," by the St. Louis Park Health Department, August 1, 1972.
- (4) "Status Report on Creosote Site and TexaTonka Area", prepared by the St. Louis Park Planning Department, January 11, 1973.
- (5) "Surface and Subsurface Ground Reclamation; Republic Creosote Site, City of St. Louis Park", prepared by OSM Consulting Engineers, April 23, 1973.

- (6) "Storm Water Study; Public Improvement #72-43 (Republic Creosote Area)," prepared by OSM Consulting Engineers, August 6, 1973.
- (7) "Geology of the St. Louis Park Area A Review by the Minnesota Geological Survey; Report on Investigation of Municipal Water Supply, St. Louis Park," prepared by the Minnesota Department of Health, March 1974.
- (8) "Soil Investigation; Proposed Storm Sewer and Holding Ponds near Highway 7 and Louisiana Avenue, St. Louis Park," prepared by Soil Exploration Co., April 16, 1974.
- (9) "Hydrogeologic Study of the Republic Creosote Site," prepared by Gerald Sunde, Consulting Engineer, July, 1974.
- (10) "Report on Investigation of Phenol Problem in Private and Municipal Wells in St. Louis Park, Minnesota," prepared by Minnesota Department of Health, September, 1974.
- (11) Memorandum from F. F. Heisel, Minnesota Department of Health, to P. Gove, Minnesota Pollution Control Agency.
 "St. Louis Park Creosote Contamination Study," November 14, 1975.
- (12) "Data Regarding The History and Development of a Storm Sewer System for the City in the Area of the Former Republic Creosote Property," prepared by the City of St. Louis Park, November 15, 1974.
- (13) "Memorandum on Groundwater Contamination, St. Louis Park, MN," by Minnesota Pollution Control Agency, (MPCA Board Item) November 19, 1974.
- (14) "Memorandum on St. Louis Park
 Groundwater Situation," by the
 Minnesota Pollution Control Agency,
 (MPCA Board Item) December 13, 1974.

- (15) "Soil and Ground Water Investigation Coal Tar Distillation and Wood Preserving Site, St. Louis Park - Phase I Report," prepared by Barr Engineering Co., May 1976.
- (16) "Stability Study of Para Benzo Quinone for the City of St. Louis Park," prepared by Sanitary Engineering Laboratories Inc. (SERCO), June 1976.
- (17) "Soil Boring and Chemical Analysis of the Northern Portion of Oak Park Village," prepared by National Biocentric, Inc., September 17, 1976.
- (18) "Soil Contamination by Creosote Wastes," prepared by National Biocentric, Inc., November 1, 1976.
- (19) "Development Plan, Northern Portion, Oak Park Village," prepared by St. Louis Park, December 2, 1976.
- (20) "Review of Recent Studies of Soil Contamination at the Former Republic Creosote Site Recommendations to City's Proposed Development Plan," by Minnesota Pollution Control Agency, December 28, 1976.
 - (21) "Soil and Ground Water Investigation Coal Tar Distillation and Wood Preserving Site, St. Louis Park - Phase II Report," prepared by Barr Engineering Co., June 1977.
 - (22) "Assessment of Possible Human Health Effects Resulting from Contamination of the Former Republic Creosote Site," prepared by the Minnesota Department of Health, October 1977.
 - (23) "Soil Report; Prepared by Oak Park Village, St. Louis Park, Minnesota," prepared by Soil Testing Service of Minnesota, Inc., January 5, 1978.
 - (24) "Recommendations for Plugging or Modification of Abandoned Wells in the

- Area of the Former Republic Creosote Plant," prepared by the City of St. Louis Park, January 11, 1978.
- (25) "Report of Well Water Survey, St. Louis Park, Minnesota," prepared by Sanitary Engineering Laboratories, Inc., (SERCO) June-July 1978.
- (26) "Report on the Existing Creosote Problem in St. Louis Park, Minnesota," prepared by James Bailey, Agricultural Engineering, University of Minnesota, July 1, 1978.
- (27) "Health Implications of Polynuclear Aromatic Hydrocarbons in St. Louis Park Drinking Water," prepared by the Minnesota Department of Health, November 1978.
- (28) "Status Report to the MPCA: Proposed Development, Oak Park Village,"
 prepared by St. Louis Park,
 November 14, 1978.
- (29) "Water Quality Development in Oak Park Village," prepared by St. Louis Park Planning Department, December 15, 1978.
- (30) "Letter Report Tabulating Information on Existing Wells in St. Louis Park," prepared by United States Geological Survey, February 6, 1979.
- (31) "Status Report: St. Louis Park
 Development," by the Minnesota
 Pollution Control Agency (MPCA Board
 Item), March 27, 1979.
- (32) "Progress Report: Investigation of Coal Tar Derivatives in Ground Water St. Louis Park," prepared by the United States Geological Survey, April 13, 1979.
- (33) "Epidemiologic Investigation of Third National Cancer Survey Data for St. Louis Park, Edina, Richfield and Minneapolis St. Paul SMSA with a

Historical Review of St. Louis Park's Water Supply," prepared by Kari Dusich, September 1979.

- (34) "Emergency Pumpout Well For Reilly Tar Site, St. Louis Park, Minnesota," prepared by Ecology and Environment, Inc., 1980.
- (35) "Examination of Cost Estimate For Three Tasks to be Completed For The Reilly Tar and Chemical Project, St. Louis Park, MN," prepared by Ecology and Environment, Inc., 1980.
- (36) "Summary Report on the City of St.
 Louis Park Activated Carbon Pilot Plant
 Study," prepared by Sanitary
 Engineering Laboratories, Inc.,
 (SERCO), January 11, 1980.
- (37) "Cancer Rates in a Community Exposed to Low Levels of Creosote Components in Municipal Water," prepared by Dusich, Sigurdson, Hall, Dean, Minnesota Medicine, November 1980.
- (38) "Preliminary Evaluation of Ground Water Contamination by Coal Tar Derivative, St. Louis Park, MN," prepared by the United States Geological Survey, January 1981.
- (39) "Report on Drinking Water Treatment and Remedy Evaluation for St. Louis Park, MN," prepared by Eugene A. Hickok and Associates, Inc., April 1981.
- (40) "Report and Statistic Water Quality: Results of St. Louis Park Water Samples," prepared by H. Taylor, United States Geological Survey, June 10, 1981.
- (41) "Study of Ground Water Contamination in St. Louis Park, MN," prepared by Eugene A. Hickok & Associates, et. al., November 1981.
- (42) "Dispersion and Sorption of Hydrocarbons in Aquifer Material," by

- G. Cohn (thesis) University of Minnesota, 1982.
- (43) "Terminating An Endless Search: An Action Approach to Solving the Water Problem," prepared by St. Louis Park, January 11, 1982.
- (44) "Request for Authorization to Negotiate and Enter into Cooperative Agreement with the U.S. EPA to Obtain Funds for Additional Cleanup Work at the Reilly Tar Site, St. Louis Park," by the Minnesota Pollution Control Agency (MPCA Board Item), May 25, 1982.
- (45) "Degradation of Phenolic Contaminants in Ground Water by Anaerobic Bacteria: St. Louis Park, MN," prepared by Erlich, Goerlitz, Godsy & Hult, United States Geological Survey, November 1982.
- (46) "Evaluation of Groundwater Treatment and Water Supply Alternatives for St. Louis Park, MN," prepared by CH2M Hill, 1982-1983.
- (47) "Recommended Plan for a Comprehensive Solution of the Polynuclear Aromatic Hydrocarbon Contamination Problem in the St. Louis Park Area," prepared by Environmental Research & Technology, Inc. for Reilly Tar & Chemical Corporation, April 1983, plus Errata, June 27, 1983 and November 27, 1984.
- (48) "Health Risk Assessment and Environmental Effects of Compounds Contaminating St. Louis Park Groundwater: Selected Two and Three Ring Heterocycles and Indene," prepared by Stephen M. Mabley, Minnesota Department of Health, Section of Health Risk Assessment, July 1983.
- (49) "Evaluation of Activated Carbon Treatment Alternative for Polynuclear Aromatic Hydrocarbon Removal for Groundwater in the St. Louis Park Area," prepared by Calgon Carbon Corporation, November 18, 1983.

- (50) "Request for Authorization to Negotiate and Execute an Amendment to the Current Cooperative Agreement with the U.S. Environmental Protection Agency for Investigation and Remedial Action at the Reilly Tar and Chemical Company Hazardous Waste Site in St. Louis Park," by the Minnesota Pollution Control Agency (MPCA Board Item), November 22, 1983.
- (51) "Assessment of Groundwater Contamination by Coal Tar Derivatives, St. Louis Park Area, MN", prepared by M. F. Hult, United States Geological Survey, Open File Report 84-867, 1984.
- (52) "Record of Decision, Remedial Action Alternative Selection," prepared by the United States Environmental Protection Agency, June 6, 1984.
- (53) "Evaluation of Granular Activated Carbon for the Removal of Polynuclear Arcmatic Hydrocarbons from Municipal Well Water in St. Louis Park, MN," prepared by Calgon Carton Corporation, September 10, 1984.
- (54) "Sampling and Analysis Plan for Calgon Accelerated Column Testing of SLP 15 Water," prepared by Environmental Research & Technology, Inc., October 25, 1984.
- (55) "Request for Issuance of a Request for Response Action to the Reilly Tar and Chemical Corporation Regarding Contamination At and Around the Reilly Tar Hazardous Waste Site in St. Louis Park," by the Minnesota Pollution Control Agency (MPCA Board Item), December 18, 1984.
- (56) "Ground-water Flow in Prairie du Chien Jordan Aquifer Related to Contamination by Ccal Tar Derivatives, St. Louis Park, MN," prepared by J. R. Stark and M. F. Hult, United States Geological Survey, 1985.

- (57) "Calgon ACT Study: Initial Results from the Accelerated Column Test of PAH Removal Performance for Activated Carbon Treatment of Water From SLP 15," prepared by Twin City Testing, January 11, 1985.
- (58) "Calgon ACT Study: Further Results From the Study of PAH Removal by Activated Carbon Treatment," prepared by Twin City Testing, January 30, 1985.
- (59) "Reilly Tar and Chemical: Analysis of Water From Three St. Peter Wells," prepared by Twin City Testing, January 31, 1985.
- (60) "Accelerated Column Test for Removal of Polynuclear Aromatic Hydrocarbons from Contaminated Groundwater," prepared by Calgon Corporation, March 8, 1985.
- (61) "PAH Analysis by GCMS," prepared by Twin City Testing March 26, 1985
- (62) "Draft Work Plan R1, Reilly Tar Site, St. Louis Park, Minnesota," prepared by CH2M Hill and Ecology & Environment, April 27, 1985.
- (03) "Predesign Memorandum Evaluation of Granular Activated Carbon System Alternatives For Removal of Polynuclear Aromatic Hydrocarbons From Municipal Well Water in St. Louis Park, Minnesota", prepared by Ch₂M Hill, May 29, 1985.
- (64) "PAH Threshold Odor Determination in St. Louis Park Municipal Supply Water," prepared by Environmental Research and Technology, Inc., May 30, 1985.
- (65) "Volatile Organic Analysis of the St. Louis Park Municipal Drinking Water Supply System, March, 1985," prepared by Environmental Research & Technology, Inc., May 30, 1985.
- (66) Feasibility of Community-Wide Epidemiologic Studies of Drinking Water and Health: St. Louis Park and New Brighton", prepared by the Minnesota Department of Health, December 31, 1985.

- (b) Field investigations and chemical analyses of water (surface and/or ground water) and soils, including associated field notes, chain of custody records, raw data sheets, sampling analysis protocols, boring and well logs and water level measurements. In general, the results of soil borings and water samples are found in the list of studies and/or reports under Part C. 13(a). (Dates listed usually reflect the time of the investigation.)
 - (1) Preliminary soil investigation for the engineering properties of the soil, performed by Soil Engineering Services, Inc., October 13, 1969.
 - (2) Mellon-Rice data on well water and plant wastewater samples,
 Carnegie-Mellon University and C.W.
 Rice Division, NUS, November 5, 1970.
 - (3) Soil sample analyses, Tri-City Public Health Lab, 1971 and 1973.
 - (4) Analysis of soil and water samples from the St. Louis Park area, by the Minnesota Department of Health, 1973 to present.
 - (5) Analysis of soil and water samples by Twin Cities Testing and Engineering Laboratory, Inc., and Soil Exploration Company, 1974 to present.
 - (6) Analysis of soil and water samples by Sanitary Engineering Laboratories, Inc. (SERCO), 1975, 1976, 1977, 1978 and 1982.
 - (7) Soil borings performed by Braun Engineering, 1974, 1979, 1980, and 1982.
 - (8) Well investigations pursuant to well abandonment program performed by Minnesota Department of Health, 1978-present.
 - (9) Analysis of soil and water by United States Geological Survey, 1978-present.

- (10) Analyses of groundwater, by Pace Laboratories, Inc., 1978-1980, 1983-1984 (1983-1984 analyses performed by Rocky Mountain Analytical Laboratory).
- (11) "Results of Analysis of Water Samples, and Soil Samples for Polynuclear Aromatic Compounds (Hydrocarbons, Azarene, Phenols)", by Midwest Research Institute, October 7, 1981.
- (12) Analyses of Ground Water, by Capsule Laboratories, Inc., 1981, 1982, and 1983.
- (13) Soil borings and analyses by GCA Corp., 1982-1983.
- (14) Water analyses by Monsanto Research Corp., 1982-1984.
- (15) Water analyses by Environmental Testing and Certification Corporation, 1983.
- (16) Soil boring and chemical analyses by National Biocentric, Inc., 1976.
- (17) St. Louis Park area water well search and inventory questionnaires, prepared by E. A. Hickok and Associates, Inc., 1982-1983.
- (18) Progress reports on the investigation and clean-out of W23 and W105, E.A. Hickok & Associates, Inc., 1982 to present.
- (19) Water samples and analyses by CH2M Hill, 1982 and 1983.
- (20) Water samples and analyses by Environmental Research and Technology, Inc., 1982 to present.
- (21) Water samples and analyses by Acurex Corporation, 1984 to present.
- (22) Water analyses by United States Environmental Protection Agency 1977 and 1981-1982.

APPENDIX B

METROPOLITAN WASTE CONTROL COMMISSION APPROVAL FOR SANITARY SEWER DISCHARGES



January 14, 1987

James N. Grube
Director of Public Works
5005 Minnetonka Blvd.
St. Louis Park, MN 55416-2290

Dear Mr. Grube:

Your request for sewering well purge water and excess well monitoring water at five (5) and possibly seven (7) additional well locations in St. Louis Park is approved for a period of one year. The discharges at the wells will occur at six month intervals. Volume of discharge at each site will total approximately 1000 gallons per event based on a pumping rate of 30 gpm. The purge/monitoring water will be rerouted to storm sewers or receiving waters if analyses indicate that contaminant levels meet surface water discharge standards. Reapplication for discharge approval is required if the monitoring events at any of the well sites extend beyond one year.

Semi-annual reports, commencing on January 1, 1987, shall be submitted to the MWCC detailing the following information for each discharge event.

- 1. Well location
- 2. Date of discharge
- 3. Volume of discharge
- 4. Contaminant analysis (PAH)

The MWCC may revoke this approval if negative impacts occur in the MDS, or if the approval conditions are not met.

If you agree to all terms and conditions of this approval please sign and date the signatory statement provided below:

I understand and accept all the conditions listed in this approval letter.

Signature

nate

Please return the original signed statement to the MWCC and retain the second statement for your records.

Sincerely,

Leo A. Hermes, P.E.

Industrial Waste Manager

LH:DS:js

cc: Douglas Robohm, MPCA

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APPENDIX C CONTINGENCY PLAN

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Contingent Actions for Contaminated Soils

It is possible that soils contaminated with coal tar materials will be encountered during the well drilling operations. It is likely, however, that any contaminated soils will be thoroughly weathered, hence, it is unlikely that volatile or "runny" coal tar wastes or contamination will be encountered.

If any coal tar wastes or contaminated soils are encountered during excavation work, the Engineer or his representative will determine if the material is suitable for use as backfill based on the following visual determination:

Excavated material containing creosote or coal tar constituents may be used as backfill material if the material is not visually polluted and does not have a noticeable odor of creosote or coal tar.

Materials suitable for backfill will be replaced in approximately its original location and covered with at least twelve inches of clean soil before final grading. Any contaminated soils that are not suitable for backfilling will be stockpiled at a temporary storage facility between West Lake Street and Highway 7 (see Figure I) until all of the work required for the well construction has been completed. The stockpiled material will then be disposed of in accordance with all applicable state and federal regulations at a RCRA hazardous waste treatment/storage/disposal (TSD) facility legally permitted to accept the material and approved by the Environmental Protection Agency and Minnesota Pollution Control Agency. The City will be responsible for said disposal activities.

The temporary storage facility is an area 100 feet by 100 feet surrounded by an eight-foot chain link fence with silt screening at the bottom (see Figure I). The facility is located in a large open field on fill material placed in a bog area that used to receive the wastewater discharge from the former Republic Creosoting plant on the Site. The temporary storage facility has adequate capacity to handle the maximum amount of contaminated materials that could be generated during the work described in these project specifications. Any contaminated materials stockpiled in the temporary storage facility will be covered with an impervious barrier and the two gates will be kept locked at all times, except when material is being added to or removed from the stockpile.

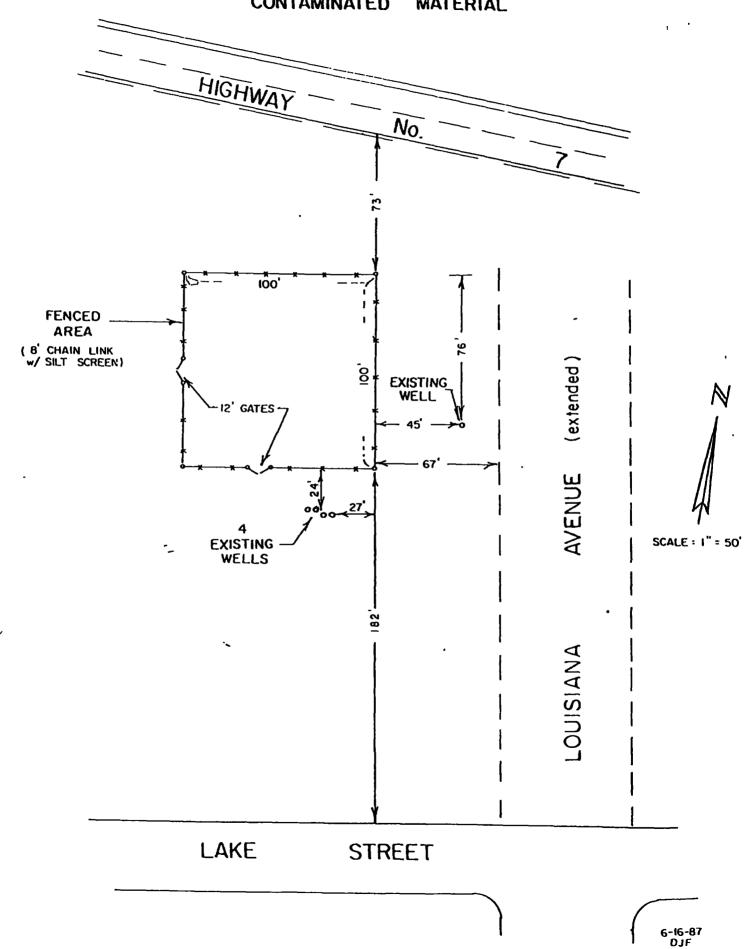
Groundwater and drilling fluids generated during well construction work will be classified as contaminated if the water exhibits a discernible oil sheen or oil phase. Contaminated water will be pumped to the sanitary sewer if it contains less than ten percent organic material. Estimates of flow rate, disposal volume and water quality will be established and the Metropolitan Waste Control Commission (MWCC) will be informed before the discharge to the sanitary sewer if the estimated flow exceeds 150 gallons per workday. Contaminated liquids containing more than ten percent organic material or failing to receive MWCC approval for discharge will be disposed of in accordance with all applicable local, state and federal rules and regulations and Part T of the Consent Decree. Uncontaminated water will be disposed of in the storm sewer or by other means acceptable to the City of St. Louis Park.

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Any use of the temporary storage facility for contaminated well construction materials will be as described above for contaminated soils.

The City will be responsible for keeping the Environmental Protection Agency, Minnesota Pollution Control Agency and Reilly Tar & Chemical Corporation informed of all significant actions involving excavation and disposal of contaminated soils and use of the temporary storage facility. All actions, decisions and communications by the City, Environmental Protection Agency, Minnesota Pollution Control Agency, and Reilly in dealing with contaminated soils will be in accordance with and subject to the provisions of Parts I, J, and O of the Consent Decree in the Reilly settlement.

TEMPORARY STORAGE FACILITY FOR CONTAMINATED MATERIAL



SECTION B

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN FOR THE ST. PETER AQUIFER REMEDIAL INVESTIGATION

ERT Document No. QAE317-500

November 1986

Amended January 1987

Amended October 1987

Prepared for:

The City of St. Louis Park St. Louis Park, Minnesota 55416

ERT - A RESOURCE ENGINEERING COMPANY 5871 Cedar Lake Road, St. Louis Park, Minnesota 55416

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OUALITY ASSURANCE PROJECT PLAN

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Date: January 1987 Number: QAE317-500

Revision: 0

1.0 INTRODUCTION

1.1 Background

ERT and the City of St. Louis Park will complete certain tasks in fulfillment of the Consent Decree and Remedial Action Plan for the St. Louis Park Site. This Quality Assurance Project Plan pertains to all work to be performed by ERT and other contractors to install five new groundwater monitoring wells in the St. Peter Aquifer. The new wells will be monitored along with a network of existing wells to determine the nature and extent of contamination in the aquifer. Monitoring data will be compared with drinking water criteria for this purpose. The existing monitoring network is not adequate for determining the nature and extent of contamination, hence the need for the five additional wells. Further details on the work to be performed, its purpose and the methodology to be employed may be found in the Site Management Plan. The schedule for this work is to complete the well construction within 120 days of approval of this Plan and project specifications pursuant to Part G of the Consent Decree.

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1.2 Quality Objectives

The purpose of this Quality Assurance Project Plan is to define the Quality Assurance and Quality Control provisions to be implemented to ensure that:

- o The new monitoring wells will conform to design and location specifications given in the Site Management Plan.
- o The work is performed in an efficient manner.
- o Field records generated during the course of the field work are complete and accurate.
- The objectives of the Consent Decree are met.

OUALITY ASSURANCE PROJECT PLAN

Page: 2 of 5

Date: January 1987 Number: QAE317-500

Revision: 0

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization is illustrated in Figure 2-1. The Project Manager, Mr. William Gregg

will oversee and coordinate all project activities, schedule and direct all field activities and will

conduct correspondence with St. Louis Park. The Project Manager/Field Coordinator is also

responsible for maintaining records of the work performed on the project and for archiving

those records in the Central File upon completion of the work. The Project Quality Assurance

Officer is responsible for ensuring that this Plan is implemented and that project data undergo

technical and peer review, as necessary. The U.S. EPA, MPCA, and MDH will have the

opportunity to audit, comment on, or otherwise participate in Quality Control procedures, and

inspect the work done on this project at any time. The drilling and well installation contractor

will perform all work necessary to install the new monitoring wells.

3.0 QA/QC - FIELD ACTIVITIES

3.1 Training

All field personnel working on the St. Peter Aquifer Remedial Investigation

(including subcontractors) will receive training on the purpose of the work, the

procedures to be employed and the Project Health and Safety Plan.

3.2 Subcontractor Quality Control

Subcontractor quality control is that system of activities which ensures that products

or services obtained from subcontractors fulfill the needs of the project.

Periodic quality control inspection of each contractor will be performed by the ERT

Project Manager/Field Coordinator to evaluate adherence to the project QA Plan

and the project Health and Safety Plan. Inspection will include (as appropriate):

o Type and condition of equipment,

o Calibration procedures,

o Personnel qualifications,

o Decontamination procedures,

o Documentation,

Level of personal protection

Page: 3 of 5

Date: January 1987 Number: QAE317-500

Revision: 0

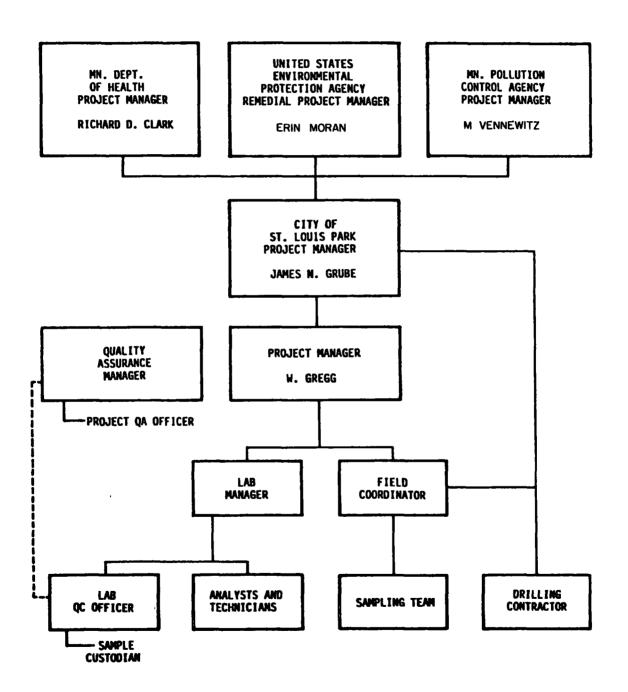


Figure 1-1 Project Quality Assurance Organization

QUALITY ASSURANCE PROJECT PLAN

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Date: January 1987

Number: OAE317-500

Revision: 0

Results of the quality control inspection will be entered in the field notebook.

3.3 Document Control and Recordkeeping

Document Control for the remedial investigation serves a two-fold purpose. It is a formal system of activities that ensures that:

1) All participants in the project are promptly informed of revisions of the

Quality Assurance Plan; and

2) All critical documents generated during the course of the work are accounted

for during, and at the end of the project.

This QA Plan and all standard Operating Procedure documents have the following information on each page:

o Document number

o Page number

o Total number of pages in document

o Revision number

o Revision date

When any of these documents are revised, the affected pages are reissued to all personnel listed as document holders with updated revision numbers and dates. Issuance of revisions is accompanied by explicit instructions as to which documents or portions of documents have become obsolete.

Control of, and accounting for documents generated during the course of the project is achieved by assigning the responsibility for document issuance and archiving. For the St. Peter Aquifer Remedial Investigation, the ERT Project Manager/Field Coordinator has this responsibility.

Documentation for the project will either be recorded in non-erasable ink, or will be photocopied promptly upon completion, and the photocopies dated. All documents will be signed by the person completing them.

QUALITY ASSURANCE PROJECT PLAN

Page: 5 of 5

Date: January 1987

Number: QAE317-500 Revision: 0

3.4 Final QA/QC measures will satisfy local, state, and federal criteria and the objectives

of the RAP.

4.0 NUMERICAL ANALYSIS AND PEER REVIEW

All numerical analyses, including manual calculation, mapping, and computer modeling will be

documented and subjected to quality control review in accordance with ERT SOP 2005,

Numerical Analysis and Peer Review. All records of numerical analyses will be legible,

reproduction-quality and complete enough to permit logical reconstruction by a qualified

individual other than the originator.

5.0 AUDITS AND CORRECTIVE ACTION

ERT conducts periodic audits to assess the level of adherence to QA policies, procedures, and

plans.

Whenever quality deficiencies are observed that warrant immediate attention, formal

corrective action request forms are issued to the project manager by the Quality Assurance

Department. The QA Department retains one copy of the form when it is issued. The project

manager completes the form and signs it when corrective action has been implemented, and

returns the original to the QA Officer to close the loop.

The Quality Assurance Department maintains a record of all corrective action requests and

reports their status to ERT management in a quarterly report.

Should an audit be conducted on the St. Peter Aquifer Remedial Investigation work, St. Louis

Park will be apprised of the audit findings and of any corrective action that is requested and

performed.

6.0 FINAL CONSTRUCTION INSPECTION

The U.S. EPA and MPCA will perform a final construction inspection prior to usage of the

monitoring wells.

SECTION C HEALTH & SAFETY PLAN

HEALTH AND SAFETY PLAN

Introduction

This Health and Safety Plan applies to on-site personnel who will potentially be exposed to soil and/or groundwater affected by creosote or coal tar constituents during the construction of St. Peter Aquifer monitor wells. This plan has been designated to comply with, as a minimum, the requirements set forth in 29 CFR 1910.120, the OSHA standards governing hazardous waste operations. In no case may work be performed in a manner that conflicts with the intent of or the safety concerns expressed in this plan. Other contractors and subcontractors involved in this project will be required to adhere to this plan as a minimum, and to conduct all work in accordance with applicable health and safety regulations, including 29CFR1910.120

Materials of Concern and effects of Overexposure

The materials of concern which have been identified at this site are coal tar and creosote related materials including naphthalene, other polynuclear aromatic hydrocarbons (PAH) and phenolic compounds.

Coal tar and creosote are typically irritating to the eyes, skin and respiratory tract. Acute skin contact may cause burning and itching while prolonged contact and poor hygiene practices may produce dermatitis. Prolonged skin contact with creosote must be avoided to prevent the possibility of skin absorption.

Naphthalene is a hemolytic agent which, upon overexposure to the vapor or ingestion of the solid, may produce a variety of symptoms associated with the breakdown of red blood cells. Naphthalene is also irritating to the eyes and repeated or prolonged contact has been associated with the production of cataracts.

Repeated exposure to certain PAH compounds has been associated with the production of cancer. Contact of PAH compounds with the skin may cause photosensitization of the skin producing skin burns after subsequent exposure to ultraviolet radiation.

Phenolics are generally strong irritants which can have a corrosive effect on the skin and can also rapidly penetrate the skin. Overexposure to phenols and phenolic compounds may cause convulsions as well as liver and kidney damage.

Hazard Assessment

Initial

Because of the relatively low vapor pressures associated with PAH compounds (generally less than 10^{-4} mm Hg at $20^{\rm OC}$), they are not expected to present a vapor hazard at this site. The most likely threat of exposure to these compounds will be via skin contact.

Although naphthalene and phenol also have relatively low vapor pressures (0.05 and 0.36 mm Hg at 200C, respectively) there is a possibility that these substances may produce vapor hazards at this site under adverse conditions.

Continuing Hazard Assessment On-Site

Air Monitoring

An HNU Photoionization Detector (PID) equipped with a 10.2 eV lamp will be used by the Engineer to provide semiquantitative data on VOC concentrations in and around the breathing zone of workers. The Engineer will conduct air sampling by taking and recording periodic readings in the breathing zone over freshly-exposed soil being excavated.

TABLE 1
ACTION LIMITS FOR AIR CONTAMINANTS

Limit	Persistent Concentration in the Breathing Zone	Procedure
Lower	5 ррт	Don respirators, step up monitoring.
Upper	50 ppm	Stop work and back off from immediate work area until levels subside in the breathing zone.

Action Limits

The American Conference of Governmental Industrial Hygienists (ACGIH) has established threshold limit values (TLV) for phenol and naphthalene at 5 and 10 ppm, respectively, as 8-hour time weighted averages (TWA). Based on these values, the action limits in Table 1 have been set. The lower limit of 5 ppm is based on the TLV for phenol while the upper limit of 50 ppm is based on a minimum protection factor of 10 for a half-mask, air purifying respirator.

Response

When the PID yields persistent breathing-zone readings at or above the lower action limit, workers in the affected area will don respirators. Air sampling will continue on a more frequent basis. If readings are persistent at or above the upper limit, workers shall back off from the immediate work area until measured breathing-zone concentrations fall below the lower limit, at which time operations will resume and normal air monitoring will continue. If breathing zone levels do not fall below the upper limit, workers are to leave the work area and report the condition immediately to the City, the Engineer, or its representative. If necessary, engineering controls will be instituted to maintain vapor concentrations below the upper limit or arrangements will be made to upgrade to Level B protection.

Personal Protective Equipment

Personal protective equipment (PPE) will be donned, as necessary, based on the hazards encountered. Listed below is the personal protective equipment to be utilized during this project and the conditions requiring its use.

Personal Protective Equipment

- Coveralls Polyethylene coated Tyvek if work involves contact with affected soil or groundwater.
- Boots Chemical resistant type if work involves contact with affected soil or groundwater.
- Hard Hat When working in the vicinity of operating heavy machinery.
- Face shield If splash hazard exists.
- Gloves Nitrile for potential contact with affected soil or groundwater.
- Respirator MSA Comfo II with GMC-H Cartridges if PID reading exceeds 5 ppm or if dust or odors become objectionable.
- Chemical Safety Goggles If eye irritation occurs.

Because of the carcinogenicity of certain PAH compounds, and because of the skin hazards associated with PAH and phenolic compounds, it is important that appropriate protective clothing be worn during work activities, which may involve the possibility of skin contact with affected soil or groundwater. As a minimum, the presence of visible creosote or coal tar related material shall constitute evidence of affected soil or groundwater.

Health and Safety Training

Site personnel covered by this Health and Safety Plan must have received appropriate health and safety training prior to their working on the site. Training will include:

- Requirements for and use of respirators and personal protective equipment.
- Cautions regarding the potential for trench collapse.
- Required personal hygiene practices.
- Requirements for employees to work in pairs.
- Proper material handling.
- Proper sampling procedures.
- Maintenance of safety equipment.
- Effective response to any emergency.
- Emergency procedures (e.g., in the event of a trench collapse).
- Hazard zones.
- Decontamination methods.
- General safety precautions.

A copy of the Standard Safety Procedures (Table 2) will be given to each worker covered by this Health and Safety Plan.

Decontamination

Administrative procedures require hygienic practices consistent with work hazards. Employees will be instructed in the training program on proper personal hygiene procedures.

Contaminated, reuseable PPE, such as boots, hard hats, face shields and goggles, will be decontaminated prior to leaving the site. The decontamination procedure follows:

- Rinse with water to remove gross contamination.
- Wash in Alconox or equivalent detergent solution.
- Rinse with clean water.

Contaminated, disposable PPE, such as Tyvek coveralls and gloves will be placed in 55-gallon drums and stored on site while arrangements are made for disposal.

TABLE 2

STANDARD SAFETY PROCEDURES

- Employees are required to work in pairs.
- Wash face and hands prior to eating, smoking, or leaving the site.
- No smoking or eating is allowed in the work area during excavation or sampling activities.
- Wearing of contact lenses is not permitted in the work area.
- Contaminated material (e.g., Tyvek coveralls) must be properly disposed of before leaving the site.
- All work must be conducted in accordance with local, state and federal EPA and OSHA regulations, particularly 29 CFR 1910.120.
- The walls of trenches greater than 4 feet in depth must be sloped back to the angle of repose prior to entering. For average soil, an angle of 45⁰ is recommended.

Respirators, if used, will be cleaned and disinfected after each day of use. The facepiece (with cartridge removed) will be washed in a hypochlorite (or equivalent) disinfecting solution, rinsed in warm water and air dried in a clean place.

Emergency Procedures

This Health and Safety Plan has been established to allow site operations to be conducted without adverse impacts on worker health and safety as well as public health and safety. In addition, supplementary emergency response procedures have been developed to cover extraordinary conditions at the site.

General

All accidents and unusual events will be dealt with in a manner to minimize a continued health risk to site workers. In the event that an accident or other unusual event occurs, the following procedure will be followed:

- First aid or other appropriate initial action will be administered by those closest to the accident/event. This assistance will be conducted so that those rendering assistance are not placed in a situation of unacceptable risk. In the event that a worker is caught in a trench collapse, call for emergency assistance immediately.
- All accidents/unusual events must be immediately reported to the Owner.
- All workers on site should conduct themselves in a mature, calm manner in the event of an accident/unusual event, to avoid spreading the danger to themselves, surrounding workers and the community.

Responses to Specific Situations

Emergency procedures for specific situations are given in the following paragraphs.

Worker Injury

If an employee in an affected area is physically injured, Red Cross first-aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If an excavation collapses and a worker is caught, call for emergency assistance immediately. If the person is in no immediate danger, do not attempt to move him. Internal injuries could be worsened. If the employee can be moved, he will be taken to the edge of the work area (on a stretcher, if needed) where contaminated clothing (if any) will be removed, emergency first-aid administered, and transportation to a local emergency medical facility awaited.

If the injury to the worker is chemical in nature (e.g., overexposure), the following first-aid procedures are to be instituted:

 Eye Exposure - If affected solids or liquids get into the eyes, wash eyes immediately using large amounts of water and lifting the lower and upper lid occasionally. Obtain medical attention immediately.

- Skin Exposure If affected solids or liquids get on the skin, promplty wash the affected skin using soap or mild detergent and water. Obtain medical attention immediately when exposed to concentrated solids or liquids.
- Inhalation If a person inhales large amounts of a toxic vapor, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.
- Swallowing When affected solids or liquids have been swallowed, the Poison Control Center will be contacted and their recommended procedures followed.

NO COMPENSATION WILL BE PROVIDED FOR SAFETY MEASURES TAKEN BY THE CONTRACTOR TO MEET THE REQUIREMENTS OF THIS HEALTH AND SAFETY PLAN.

SECTION D COMMUNITY RELATIONS PLAN

COMMUNITY RELATIONS PLAN

The St. Peter Aquifer Remedial Investigation is to be completed in accordance with the Consent Decree - Remedial Action Plan for Reilly Tar & Chemical Corporation's St. Louis Park, Minnesota, N.P.L. Site. All community relations programs related to this work will be coordinated through the following agencies:

United States

Ms. Judy Beck

United States Environmental Protection Agency

(312) 353-1325

State of Minnesota

Ms. Susan Brustman

Minnesota Pollution Control Agency

(612) 296-7769

City of St. Louis Park

Ms. Sharon Klumpp

City of St. Louis Park

(612) 924-2523

Information necessary to conduct the Community Relations Plan will be provided by the City and Reilly.

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